COLONY AND PROTECTORATE OF KENYA

DEPARTMENT OF AGRICULTURE ANNUAL REPORT 1947

PARTS I, II AND III

COMMONWEALTH MYCOLOGICAL INSTITUTE
9 JUN 1949

1949
PRINTED BY THE GOVERNMENT PRINTER
NAIROBI

PRICE: TEN SHILLINGS

CONTENTS

PART I—AGRICULTURE IN 1947 — PAGE

Weather .. 1
Agricultural Exports in 1947 .. 4
Crops .. 4
Livestock Produce .. 10
Production in Native Areas .. 10
Locusts .. 11

PART II—POLICY AND WORK OF THE DEPARTMENT

General .. 13
Departmental .. 13
Experimental Work .. 13
Fruit .. 16
Vegetable Seed Production .. 16
Extension Work .. 16
Soil Conservation .. 17
Agricultural Education .. 18
Produce Marketing and Inspection .. 18
Grading, Inspection and Cool Store Services .. 18
Library and Publications .. 19
Agricultural Legislation .. 20
Staff .. 21

PART III—SECTIONAL REPORTS

Senior Agricultural Officer, Nyanza Province .. 23
Senior Agricultural Officer, Central Province .. 39
Senior Agricultural Officer, Coast Province .. 58
Agricultural Officer, Nakuru .. 68
Assistant Agricultural Officer, Kitale .. 70
Assistant Agricultural Officer, Eldoret .. 76
Senior Soil Conservation Officer .. 82
Senior Entomologist (Coffee Services) .. 99
Plant Physiologist and Pathologist (Coffee Services) .. 111
Agricultural Chemist (Coffee Services) .. 116
Senior Agricultural Chemist .. 123
Soil Chemist .. 132
Senior Entomologist .. 137
Senior Plant Pathologist .. 139
Senior Plant Breeder .. 142
Senior Agricultural Officer (Pasture Research) .. 150
Agricultural Officer (Pyrethrum) .. 155
Agricultural Officer (Horticulture) .. 161
Agricultural Officer (Sisal) .. 166
Grading, Inspection and Cool Store Services .. 167
Egerton School of Agriculture .. 181
Index .. i-iv

INDEX

PAGE

A

Agricultural Betterment Fund 32–3
Agricultural Education 18, 33, 53, 64, 181
Agricultural Exports 4–5
Agricultural Legislation 20
Agriculture—
  African 16, 25, 46–9
  European 16, 24
  Indian 25
Animal Products 10

B

Bacon 10
Bananas 43, 69
Barley 4, 77, 147
Beans 28, 77, 127, 169
Beeswax 44
Bukura Agricultural School 33–4
Bush Clearing 92–3
Butter 10

C

Camomile 128
Caraway 15, 128
Cashew Nuts 4, 60
Cassava 4, 28, 50, 59
Castor Seed 45
Catha edulis (*Miraa*) 45, 126
Cattle 33, 75, 100, 186
Cereals 15, 27, 59, 68, 126–7
Cinchona 28
Citrus 64, 66, 78
Coconuts 59
Coffee—
  Chemistry 101–2
  Crop Reduction Trials 105–6
  Cultivation Trials 104–8, 110, 117–8
  Die-back 105, 106, 107, 120
  Diseases 27, 100–1
  Entomological Work 14, 101
  Experimental Work, Field 101, 104–8, 109–10, 119
  Fermentation 111, 121
  Growth Observations 115
  Inflorescence 112
  Leaf-fall 107, 122
  Liquoring 111–2, 121
  Manurial Trials 110
  Mulching Experiments 109, 119–22
  Native-Grown 27, 42–3
  Pests 101, 110
  Pruning Experiments 104–5, 109
  Raoeng, Preparation of 101, 111–2
  Selection Trials 110
  Shade Trees 110
  Soil Moisture Measurement 112, 116
  Spraying Experiments 106, 122
  Uptake of Nutrients 120
  Variety Trials 50–1, 110
  Vegetative Propagation 102
  Yields 4, 27, 72, 118
Cool Stores 19, 173
Copra 4, 61
Coriander 15, 45
Cotton 4, 26, 60

PAGE

Crop—
Cash 29, 41
Improvement 29, 45–6
Investigations 34–5, 50–2, 64–6, 69, 126–8
Planting and Harvesting Times 44
Production 4–9, 10–1, 24–9, 41–4, 59–62, 72–3, 176–8, 185
Residues 80
Cropping, Strip 48

D

Dairying 75, 100, 186–7
Dams 31, 49, 85–6
Datura spp. 34, 54, 73, 78–9
Dill 15, 127
Diseases, Crop 34, 54, 66
Drainage 88

E

Education, Agricultural 18, 33, 53, 64, 181
Eggs 10, 44
Eleusine (wimbi) 27, 29
Embu School 18, 53
Essential Oils 7, 25, 126
Experimental Work .. .. 13–6, 34–5, 50–2, 64–6, 69, 74–5, 80–1, 99 *et seq.*
Exports, Agricultural 4–5
Extension Work 16

F

Famine Prevention 31, 50
Farm, Planning and Inspection 79, 90
Farms, Departmental 35–6, 71, 184–9
Fertilizers 35, 51, 64–5, 74, 78, 110, 119–21, 135, 156–7
Flax 7, 77
Fruit 16, 46, 62, 78, 161–5

G

Grading and Inspection 18–9, 167
Grain Storage 123–4
Grass—
Ecology 150–1, 153–4
Pasture spp. 66, 151, 153
Planting 30, 48, 63
Seed 45, 73, 94, 128
Trials 34, 52, 69, 94
Grassland—
Leys 46, 73, 75, 92, 94, 185
Management 44, 46, 49, 100, 151, 185
Natural 91, 150–1
Grazing—
Experiments 51, 154
Management 30, 44, 91
Groundnuts 7, 27, 64–5

H

Hides 10, 44
Horticulture 16, 161

I

Insect Pests 34, 54, 66, 73, 78, 101, 110, 137–8
Insecticides 123–4, 125–6
Irrigation Project 133–4

PAGE

K

Kapok 7, 61
Kudzu Vine 128

L

Land—
Drainage 88
Settlement 47, 66
Utilization Surveys 15, 88, 133
Legumes 28, 41, 45, 69, 77, 80
Linseed 7, 77
Locusts 11

M

Maize—
Grading and Conditioning 168, 171, 172
Hybrid 35, 64, 74, 126–7, 148
Seed Competition 148
Selection 34, 126
Yields 7, 27, 41, 59, 68, 72, 76
Manuring 17, 30, 46, 63
Marketing 18, 31–2, 53
Meteorological Conditions 1–2, 24, 40, 58–9, 68, 70, 76
Millets 8, 27, 29, 44, 59
Mixed Farming, Native Progress in 30, 46
Mtama (Sorghum) 8, 27, 44, 59, 64
Mustard 127

O

Oats 7, 68, 77, 147–8

P

Papain 25
Pasture—
Ecological Surveys 153
Identification of Plants 152, 153, 154
Research 15, 150–2
Trials 69, 75, 80
Passion Fruit 8
Pawpaw 25, 46
Pigs 45, 75, 187
Plant—
Breeding 16, 142–9
Diseases 34, 54, 66, 139–141
Protection 15–6, 137
Trials 15, 34, 52, 64, 66, 69, 74–5, 80
Policy, Agricultural 13
Potatoes— 8, 15, 28, 41, 140
Diseases 28, 34, 41, 52
Sweet 28, 50, 59
Poultry 10, 40, 187
Produce—
Grading and Conditioning 18, 168–72
Inspection 18, 31, 52, 167
Publications 19
Pulses 8, 28, 41, 61, 69, 77
Pyrethrum 8, 44, 77
Analytical Work 129–31
Breeding and Selection 130, 149
Cultivation Trials 156–8

PAGE

Pyrethrum—(*contd.*)
Experimental Work 13–4, 130–1, 155–60
High Toxic Strains 14, 156, 157–8, 159
Insecticide 14, 123–4, 140, 156, 158
Ramularia (Bud) Disease 14, 155–6, 158–9

R

Rainfall 1–3, 24–5, 40, 56, 58–9, 68, 70, 76, 142, 160, 165
Rice 8, 27, 34, 59

S

Safflower 15, 69, 127
Seed Testing 139
Sesame (Simsim) 8, 27, 60
Silicophosphate—
Manufacture of 15, 78, 135–6
Trials 35, 51, 64–5, 74
Simsim (See *Sesame*)
Sisal 8–9, 14, 62, 166
Soil—
Conservation 17, 25, 30–1, 47–9, 62–4, 69, 73, 79, 82–94
Fertility 13, 30, 47–9, 55
Investigational Work 132–3
Structure 134–5
Sorghums (*Mtama*) 8, 27, 44, 59, 64
Sorghum, Perennial Kavirondo 152
Soya Beans 75, 77
Stalk Borer 34, 54, 66, 73, 76, 78, 80–1, 137–8
Strip Cropping 30, 48
Sugar 9, 25, 62
Sunflower 9, 25, 73, 78
Sunn Hemp 25
Swamps 49

T

Tea 9, 24
Terracing 17, 30, 47–8, 63, 69, 87
Tobacco 9
Flue-cured 42
Native 42, 62
Nicotine 128
Trees 28–9, 49
Diseases 16, 140–1

V

Vegetables 9, 16, 28, 43, 61, 66

W

Wattle 9, 21, 28, 41, 78
Waxes, Hard, From Sisal Wastes 126
Weeds, Noxious 34, 54, 73, 78–9
Weedicides 15, 125
Wheat 43, 72, 77, 142
Baking Quality 142, 144, 146
Breeding 144–7
Diseases 15, 142
Seed 15, 143
Varieties 15, 72, 142, 143
Yields 9, 68, 72, 77
Wimbi (See *Eleusine*)
Wool 10

DEPARTMENT OF AGRICULTURE

ANNUAL REPORT 1947

PART I—AGRICULTURE IN 1947

WEATHER

Only in the Coast Province was there a real break between the short rains of 1946 and the long rains of 1947. Throughout the Colony the latter were excessively heavy and followed by inadequate short rains resulting in a poor crop year in spite of the total rainfall for the year being considerably above average.

(*For the following detailed notes on weather conditions, together with Tables A and B, the Director of Agriculture is indebted to the Director of the British East African Meteorological Service.*)

Rift.—Rainfall was good up to and including September, particularly during the long rains period. A very late start of the short rains resulted in October and November being rather dry, but the total for the year was 37 per cent above the average.

West Rift.—The total for the year was 30 per cent above the average, due mainly to good rain in January, April and September. November was the only really dry month.

East Rift.—The long rains were good and the short rains poor, and the total for the year was 31 per cent above the average.

Trans Nzoia.—The rains were, on the whole good, and the total for the year was 24 per cent above average. April was particularly wet, an excess of 5 inches above average being recorded.

Kavirondo.—The rains were good in this area also, the only very dry month being November. The total for the year was 15 per cent above average.

Main Coffee Areas.—Generally speaking, rainfall was above average during the first half of the year and below average during the second half, January being wet and the long rains good. The total for the year was 29 per cent above the average.

Coast.—The rain was somewhat "patchy" on the coast, and it was only an exceptionally wet May, with 19 inches above the average, which turned the total for the year from slightly below to 44 per cent above average.

TABLE A

EAST AFRICAN METEOROLOGICAL DEPARTMENT

RAINFALL OVER THE MAIN AGRICULTURAL AREAS OF KENYA—1947

District	Rift		West Rift		East Rift		Trans Nzoia		Kavirondo		Main Coffee Areas		Coast	
Number of Stations	20		10		17		20		20		25		14	
	Mean Fall 1947	Ave. Fall	Mean Fall 1947	Ave. Fall	Mean Fall 1947	Ave. Fall	Mean Fall 1947	Ave. Fall	Mean Fall 1947	Ave. Fall	Mean Fall 1947	Ave. Fall	Mean Fall 1947	Ave. Fall
	In.	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
January	2·82	0·95	4·38	1·32	2·09	1·09	3·03	0·67	5·18	1·61	4·50	1·43	0·70	0·93
February	1·56	1·41	2·93	2·38	1·13	1·36	1·85	1·51	3·89	3·18	0·81	1·86	0·01	0·52
March	4·39	2·95	5·06	3·99	4·87	2·35	3·35	2·70	5·72	5·30	7·98	4·61	2·31	1·87
April	10·21	5·16	13·28	6·24	9·63	5·14	10·29	5·38	12·23	8·15	13·16	8·96	9·04	5·50
May	7·22	4·79	7·41	6·13	6·47	4·24	7·17	6·22	11·44	9·40	7·72	5·40	30·81	11·88
June	3·56	3·18	5·01	5·15	2·29	2·29	4·51	4·59	5·95	5·70	2·80	1·55	3·10	4·91
July	5·29	3·92	6·72	5·95	3·57	3·44	8·31	5·82	5·96	4·79	1·54	0·64	0·38	2·82
August	4·93	4·08	6·24	6·68	4·07	3·43	5·38	6·45	4·63	6·36	0·23	0·87	5·14	2·48
September	3·81	2·47	6·49	3·88	2·12	1·63	4·39	3·57	7·21	5·44	2·04	1·07	2·26	2·87
October	1·68	2·19	2·37	2·47	1·02	2·33	2·41	2·42	2·93	3·78	0·85	2·81	1·43	3·11
November	1·45	2·69	0·90	2·90	2·65	3·30	0·69	2·51	1·85	4·96	5·01	5·96	1·82	2·76
December	1·63	1·59	2·87	1·83	2·54	1·79	1·69	0·92	4·13	3·20	2·83	3·20	3·62	2·53
Year	48·55	35·38	63·66	48·92	42·45	32·39	53·07	42·76	71·12	61·87	49·47	38·36	60·62	42·18

TABLE B

PERCENTAGE DEPARTURES

	Rift	West Rift	East Rift	Trans Nzoia	Kavirondo	Main Coffee Areas	Coast
January	+197	+232	+92	+352	+222	+215	—35
February	+11	+23	—17	+23	+22	—56	—98
March	+49	+27	+107	+24	+8	+73	+23
April	+98	+113	+87	+91	+50	+47	+64
May	+51	+21	+53	+15	+22	+43	+159
June	+12	—3	Normal	—2	+4	+81	—37
July	+35	+13	+4	+43	+25	+141	—87
August	+21	—7	+19	—17	—27	—73	+107
September	+54	+67	+30	+23	+33	+91	—21
October	—23	—4	—56	Normal	—22	—70	—54
November	—46	—69	—20	—72	—63	—16	—34
December	+3	+57	+42	+84	+29	—11	+43
YEAR	+37	+30	+31	+24	+15	+29	+44

AGRICULTURAL EXPORTS IN 1947

The year 1947 showed a considerable increase in the value of agricultural produce exported from Kenya, the total amount being £7,589,576, an increase of 35 per cent over the 1946 figure of £5,622,128.

Prominent among the increases were bacon and ham (40 per cent), butter (20 per cent), maize meal and flour (38 per cent), sugar (128 per cent), and passion fruit juice (45 per cent), whilst pulses (other than beans) and wheat exports were twice and eight and a half times respectively the figures for 1946.

Sisal took the place of pyrethrum as the export with the highest value, whilst coffee retained the second place; tea and maize were third and fourth in value respectively.

Table C gives the quantities and values of the major items of agricultural produce exported during *the last five years,* and for comparison, the corresponding figures for 1939.

CROPS

Barley.—The acreage planted to barley decreased from 10,235 acres in 1945–46 to 8,162 acres in 1946–47, with a drop in production from 52,525 bags to 44,924 bags, the average yield per acre increasing from 5.1 to 5.5 bags per acre. Planting orders were issued for 9,573 acres in 1947.

The price to the producer for malting barley was Sh. 25/50 per bag of 180 lb. and for feed barley, Grade 1, Sh. 15 per bag of 180 lb.

Cashew Nuts.—There was a reduction from last year's figure of 752 tons to a total of 642 tons for the 1946–47 crop which, coupled with a reduction of the price paid to the grower—from 12 cents to 10 cents per lb., resulted in the cash return being reduced from £10,014 to £7,190. At the end of the year, however, prospects for the next crop were very encouraging.

Cassava.—Sales decreased in 1947 to 24,948 bags, valued at £6,237, as compared with 37,404 bags valued at £9,351 in 1946. This valuable famine reserve crop is not yet established as a cash crop, although could this be done, its popularity would probably be increased and its cultivation extended.

Coffee.—Production increased from 6,952 tons for the 1945–46 crop to 9,043 tons for the 1946–47 crop, the comparative cash return being £698,160 in 1945–46 and £1,028,245 in 1946–47. The average pay-out per cwt. increased from Sh. 101/64 per cwt. to Sh. 111/68 per cwt.

Hemeleia Vastatrix was more prevalent than usual and extended its ravages even to the higher altitudes, but at the end of the year it seemed probable that there would be a considerable increase in the 1947–48 crop—compared with 1946–47. Labour troubles were experienced early in the season but were overcome by firm handling, and subsequently labour was fairly plentiful.

Interest in coffee growing by Africans in Central Province increased considerably, but in Kisii little increase of planting took place. The total return to African growers in 1947 was £6,306.

Copra.—Production fell from 1,783 tons in 1946 to 1,300 tons in 1947, due to increased local consumption of coconuts for food. The prices of Sh. 9/25 per frasila for local and Sh. 9/50 per frasila for plantation, were the same as in the previous year, and the total cash return fell from £44,575 to £39,000.

Cotton.—There was a small increase in the over-all production of the Colony from 5,015 bales for the 1945–46 crop to 5,148 bales for the 1946–47 crop. Within this total, however, an increase of 745 bales at the Coast—more than doubling the previous crop—was almost offset by a decrease of 612 bales in Nyanza. Price of first-grade seed cotton was 21 cents per lb. in Nyanza and 22 cents per lb. at the Coast.

QUANNYA, EXPORTED DURING THE YEARS

Comm	Value				
	1943	1944	1945	1946	1947
	£	£	£	£	£
ANIMALS LIVING:—					
Cattle .. .	—	17	—	—	74
Sheep and Goats	30	118	477	1,022	801
ANIMAL PRODUCTS:					
Bacon and Ham 0	9,757	19,171	25,852	40,058	64,031
Beeswax .. . 2	1,750	—	3,362	9,078	9,320
Butter .. . 7	18,450	39,969	98,402	153,988	273,735
Cheese .. . 7	410	502	1,170	3,102	6,614
Ghee .. . 2	263	379	18,458	9,550	846
Hides (shade drie 2	185,547	138,033	114,474	157,738	277,696
Hides (sun dried) 4	39,267	31,253	20,678	49,317	67,927
Skins (Sheep and 2	49,842	45,456	32,940	98,571	211,655
Skins (Sheep and 0	57,549	52,540	28,749	73,226	118,100
Wool .. . 8	27,445	33,425	168	30,156	41,846
CROP PRODUCE:—					
Coco-nuts and C 1	819	991	124	645	586
Coffee .. . 7	562,651	528,844	639,433	950,179	1,311,633
Cotton .. . 1	157,520	163,115	104,805	40,685	99,472
Sisal .. . 4	555,563	707,746	769,494	858,830	1,360,883
Flax .. . 0	102,351	123,750	72,486	75,801	14,504
Beans .. . 0	1,625	2,254	27,533	80,544	45,378
Maize .. . 7	28,655	15,178	458,294	155,796	671,730
Maize Meal and 0	14,406	16,738	7,207	37,275	76,760
Pulses, other than 2	255	602	26,130	112,121	363,084
Wheat .. . 3	794	3,214	166,319	27,351	285,449
Wheat Flour . 5	117,750	181,612	153,950	233,205	216,314
Grain, other than 4	3,119	22,805	97,532	121,360	50,815
Groundnuts . 2	350	—	—	9	2
Linseed .. . 5	498	3,408	14	17	319
Cashew Nuts . 2	5,413	6,507	7,534	22,513	13,952
Sesame .. . 9	—	—	84	20	3
Coco-nut Oil . 6	1,072	5	29	—	257
Essential Oils . 6	6,091	12,128	17,074	21,332	17,675
Groundnut Oil . 0	3,045	—	8	78	17
Sesame Oil . 8	181	2	14	28	207
Potatoes .. . 9	13,856	33,248	62,007	46,549	29,681
Pyrethrum . 0	461,217	835,289	792,895	1,156,402	271,999
Sugar .. . 8	27,320	16,088	27,521	14,464	31,621
Tea .. . 2	512,146	512,628	532,447	534,240	907,079
Wattle Bark . 6	50,440	93,034	89,448	78,135	132,924
Wattle Extract . 8	124,448	173,962	165,103	253,350	313,685
Passion Fruit Jui 3	2,569	2,714	1,685	2,233	4,365
Rubber, Plantati 8	27,736	11,814	14,900	3,160	—
OTHER AGRICULTU 5	48,628	64,858	141,415	170,000	296,628
5	3,220,828	3,883,397	4,720,215	5,622,128	7,589,578

C

S, THE PRODUCE OF KENYA, EXPORTED DURING THE YEARS
TO 1947

		Value					
1946	1947	1939	1943	1944	1945	1946	1947
		£	£	£	£	£	£
—	21	—	—	17	—	—	74
1,210	864	—	30	118	477	1,022	801
4,654	6,592	9,080	9,757	19,171	25,852	40,058	64,031
717	590	5,162	1,750	—	3,362	9,078	9,320
23,472	28,539	82,797	18,450	39,969	98,402	153,988	273,735
499	898	2,987	410	502	1,170	3,102	6,614
1,257	142	7,862	263	379	18,458	9,550	846
25,640	21,980	53,372	185,547	138,033	114,474	157,738	277,696
8,515	9,810	43,444	39,267	31,253	20,678	49,317	67,927
864,966	1,392,149	18,152	49,842	45,456	32,940	98,571	211,655
810,539	1,051,632	40,900	57,549	52,540	28,749	73,226	118,100
6,690	9,089	56,578	27,445	33,425	168	30,156	41,846
41	56	1,561	819	991	124	645	586
193,342	213,814	800,827	562,651	528,844	639,433	950,179	1,311,633
6,537	14,549	124,021	157,520	163,115	104,805	40,685	99,472
24,555	24,283	442,434	555,563	707,746	769,494	858,830	1,360,883
589	128	810	102,351	123,750	72,486	75,801	14,504
53,020	29,750	40,250	1,625	2,254	27,533	80,544	45,378
348,245	1,248,802	222,037	28,655	15,178	458,294	155,796	671,730
82,737	114,377	25,450	14,406	16,738	7,207	37,275	76,760
59,011	176,208	2,702	255	602	26,130	112,121	363,084
33,815	328,242	393	794	3,214	166,319	27,351	285,449
192,676	166,088	50,655	117,750	181,612	153,950	233,205	216,314
126,590	70,702	4,424	3,119	22,805	97,532	121,360	50,815
—	—	4,442	350	—	—	9	2
1	5	5	498	3,408	14	17	319
74	59	1,812	5,413	6,507	7,534	22,513	13,952
1	—	14,499	—	—	84	20	3
—	1,012	2,346	1,072	5	29	—	257
5,698	5,671	4,956	6,091	12,128	17,074	21,332	17,675
300	64	680	3,045	—	8	78	17
106	758	10,008	181	2	14	28	207
95,511	54,898	29,199	13,856	33,248	62,007	46,549	29,681
148,855	34,583	357,170	461,217	835,289	792,895	1,156,402	271,999
12,729	29,053	50,308	27,320	16,088	27,521	14,464	31,621
79,920	85,588	501,732	512,146	512,628	532,447	534,240	907,079
157,030	205,007	72,846	50,440	93,034	89,448	78,135	132,924
238,923	231,789	91,438	124,448	173,962	165,103	253,350	313,685
6,527	9,511	6,713	2,569	2,714	1,685	2,233	4,365
468	—	68	27,736	11,814	14,900	3,160	—
—	—	58,375	48,628	64,858	141,415	170,000	296,628
		3,242,475	3,220,828	3,883,397	4,720,215	5,622,128	7,589,578

Excessive main rains in Nyanza delayed planting of the 1947–48 crop, which suffered considerable damage from *Lygus, Helopeltis* and *Bacterium Malvacearum*. Stainer infestation, however, was for the first time for many years almost negligible. At the coast growth was at first good, but the crop was reduced by the failure of the short rains. At the end of the year estimates for the total crop showed a slight decrease on the previous season.

Essential Oils.—Exports for 1947 were almost the same as for 1946, the actual figure being 5,671 gallons, valued at £17,657. This is one of the few agricultural products which declined in value.

Flax.—Plantings during 1946 declined sharply to approximately 700 acres as compared with the previous season's 3,500 acres. The crop amounted to 65 tons fibre and 40 tons tow, valued at £183 per ton and £45 per ton respectively. Plantings during 1947 are estimated to be approximately the same as in 1946. Climatic conditions during the year were generally good and no damage from pests or diseases was reported.

Groundnuts.—Although weather conditions induced late plantings, growth was good and yields up to average in Nyanza Province. The quantity sold to the Control during the year was 13,292 bags (180 lb.) compared with 14,355 bags in 1946.

Kapok.—The price increased from 25 cents per lb. in 1946 to 30 cents per lb. in 1947. This caused a considerable increase in the amount sold and 50,000 lb. were marketed during 1947 as compared with 30,000 lb. in 1946.

Linseed.—Seventy tons of linseed were imported from Canada and issued to farmers on an undertaking to return one and a half times the seed issued. Unfortunately the seed arrived late for planting and the total area sown only amounted to 372 acres. Yields varied considerably and cannot be considered a reliable indication of what may be expected in future. The guaranteed price to the producer is Sh. 42 per 100 lb. without bag, for both 1947 and 1948 planted crops.

Maize.—The 1946–47 non-native crop produced 789,477 bags from 110,211 acres, together with 75,096 bags of squatter maize. Yield per acre showed a slight improvement to 7.1 bags per acre as compared with 6.6 bags per acre for the 1945–46 crop.

Had it not been for the exceptionally heavy rains it is likely that the average yield per acre would have been even higher, as a considerable acreage was destroyed or badly damaged by waterlogging. Stalk-borer caused heavy losses in the Trans Nzoia and parts of North Kavirondo.

Deliveries to the Control during 1947 were as follows:—

Non-native: 511,767 bags (1946: 562,243 bags).

Native: 1,132,265 bags (1946: 775,298 bags).

The price to the non-native farmer for grades K1–K7 inclusive was raised to Sh. 16/50 per 200 lb. bag f.o.r. from the beginning of the year in respect of the 1946 crop, then to Sh. 17/50 per bag f.o.r. for the 1947 crop, and subsequently to Sh. 20 per 200 lb. f.o.r., excluding the bag, from the 4th November, 1947. Payments for native-grown maize were on the same basis, but from the latest price of Sh. 20 per bag, amounts varying from Sh. 3/40 to Sh. 5 were paid into an Agricultural Betterment Fund for the benefit of the producing district. Exports of maize and maize meal to countries other than Uganda and Tanganyika, which are participants in the Cereals Pool, amounted to 549,355 bags; 35,732 bags were used for famine relief; 21,786 bags by the military and 754,563 bags for normal civil consumption in Kenya.

Oats.—The 1946–47 crop totalled 28,175 bags (150 lb.) from 5,175 acres, and it is estimated that the 1947 planted crop is approximately 9,000 acres.

Other Cereals.—Only 13,675 bags (200 lb.) of sorghum (mtama) were delivered to the Control in 1947 as compared with 27,871 bags in 1946, the decrease being largely due to the disparity in price between this and other cereals. Finger millet (wimbi) sales to the Control were 30,385 bags (200 lb.) as compared with 45,668 bags in 1946, while bulrush millet increased from 8,525 bags (200 lb.) in 1946 to 21,672 bags in 1947.

Passion Fruit.—During the 1946–47 season the acreage of vines in bearing was approximately 240 acres, with further plantings being made. Production rose from 6,907 gallons of passion fruit juice in the previous season to 10,346 gallons, of which 7,184 gallons were exported, 1,437 gallons sold locally and the balance of 1,675 gallons remained in stock at the end of the financial year on the 31st July.

The net pay-out to growers was increased from 8.4 cents per lb. in 1945–46 to 9.9 cents per lb. of fruit (not per gallon as stated in the 1946 Report).

"Woodiness" disease still causes considerable losses, but with a steadily increasing acreage coming into bearing, it is probable that the 1947–48 season will see a marked increase in production.

Potatoes.—Deliveries to the Control were:—

Non-native: 932 tons (1946: 1,976 tons).

Native: 7,285 tons (1946: 21,142 tons).

Approximately 870 tons were supplied to H.M. Forces, 2,850 tons for local consumption, and 4,500 tons for export. There were the usual seasonal shortages followed by a period when offerings were considerably in excess of local requirements and warranted a large proportion being exported.

Pulses.—The satisfactory cereal crops of Central Province induced a large increase in the marketing of the many varieties of pulses, 9,500 tons valued at £195,000 being sold as compared with 3,500 tons valued at £108,000 in 1946. Nyanza Province produced a surplus of 850 tons valued at £19,000.

Pyrethrum.—The price per ton decreased from £157 for 1st grade to £152 in the early part of the year, and again in October to £128. Four thousand and nine tons were delivered to the Agency as compared with 7,443 tons during 1946, the decrease being largely due to the Restriction Scheme which operated from the 1st August. Acreage fell from 52,827 to 47,398 acres. Bud disease continued to cause heavy losses. Sales during 1947 were low owing to a number of factors which included an overstocked market, shortage of containers and competition from synthetics, which enjoyed considerable popularity as the result of war-time propaganda At the end of the year the position had improved and stocks had been sold forward for many months.

Rice.—In Nyanza the amount of paddy bought by the Control decreased from 14,289 bags in 1946 to 4,647 in 1947. This was mainly due to the excessive rains during the early part of the year delaying preparation of the land and planting with the result that the crop was both smaller and later than usual. In the Coast Province the crop was well above average but was all consumed locally.

Sesame.—Only 900 bags were sold to the Control from Nyanza Province. A certain amount is consumed locally, but the growing of this crop has decreased greatly, giving place to the more highly priced legumes. The small crop in the Coast Province was all absorbed there.

Sisal.—An increase in price of £20 per ton as from 1st April gave added impetus to sisal production, which rose to 28,288 tons for the year as against 27,038 tons in 1946. Acreage increased from 207,438 acres to 217,268 acres, with

some 30,000 acres more cleared in readiness for plantings at the end of the year, an indication of a considerable improvement of the labour position. A special cess of £1 per ton was imposed for one year for the purpose of financing a larger research scheme; the permanent cess remains at Sh. 3/50 per ton.

Sisal exports amounted to 24,283 tons valued at £1,360,883.

A further increase of £10 per ton was negotiated as from the 1st January, 1948, and the contract with the Board of Trade extended until the 30th June, 1948, at the new price.

Sugar.—Production for the 12 months ending 30th November, 1947, was 9,171 tons of refined and 1,448 tons of raw sugar, compared with 5,760 tons of refined and 870 tons of raw sugar produced in the previous 12 months. Acreage for 1948 cutting is estimated at 13,289 compared with 12,489 acres actually cut for the last crop. Heavy rains during the year improved the outlook considerably, and the labour situation is easier.

Sunflower.—3,231 acres were planted to sunflowers as an oil seed crop, and there are prospects of a small surplus for export, in addition to supplies of seed for a considerable increase of planting next season. The present price of Sh. 26/75 per 100 lb. to the grower is likely to be maintained.

Tea.—The rain which fell during the early part of the year and merged into the long rains, resulted in a period of nine months of good growing weather, and in spite of the subsequent partial failure of the short rains, the 1947 crop was the largest since 1942. The labour situation was satisfactory.

Production was 13,384,000 lb. as compared with 12,277,000 in 1946. The acreage under tea was 14,969 acres productive and 1,578 acres not yet in production.

Wartime restrictions on the movement of East African tea were modified during 1947. As from 1st January exports by manufacturers or their accredited agents were subject to licensing control only. Free distribution was permitted within the Customs Union and all supplies surplus to internal requirements were allowed for export to any destination.

The average f.o.b. price for Kenya teas offered by the Ministry of Food was 17.46d. per lb. Sales to other overseas markets averaged about Sh. 2/3 per lb.

Tobacco.—The Central Province short rains' crop of 1946 produced 746,590 lb. of green leaf from 182 acres, and the 1947 long rains 438,750 lb. from 153 acres. The latter suffered from excessive rain with resultant water logging and considerable damage from "white mould".

The Coast Province sold 44,150 lb. of tobacco which gave a return to the producers of Sh. 26,100.

Vegetables.—Production in the Teita Hills increased from 1,090,084 lb. in 1946 valued at £5,450 to the producer, to 1,573,864 lb. in 1947 valued at £7,869. Efforts were made during the year to improve the quality and increase the variety of the vegetables grown.

In Central Province vegetable growing was—except for the closing down of the dried vegetable factories—on much the same scale as in previous years.

Wattle.—Heavy rains during the early part of the year interfered with marketing and, as a result, production of bark for the year in Central Province, fell from 574,020 cwt. in 1946 to 518,300 cwt. in 1947.

Exports from the Colony amounted to 205,007 cwt. of bark and 231,799 cwt. of extract valued at £132,924 and £313,685 respectively.

Wheat.—The 1946–47 non-native crop produced 818,102 bags (200 lb.) from 194,936 acres, an average yield of 4.1 bags per acre. This compares unfavourably with the average yield of 4.7 bags for 1945–46, when 841,036 bags were produced

from 177,943 acres. Excessive rains, lack of fertilizers and stem rust all contributed to the decrease. A small increase in acreage is expected for the 1947–48 crop.

Sales of native-grown wheat during 1947 amounted to 4,113 bags.

LIVE STOCK PRODUCE

Bacon and Lard.—Deliveries of pigs during 1947 comprised 22,723 baconers, and 2,903 larders, compared with 25,851 baconers and 4,549 larders in 1946.

Exports during the year were valued at £64,031 and consisted of 6,592 cwt. of bacon and/or ham.

Butter.—Exports during 1947 were 28,539 cwt. valued at £273,735 compared with 23,472 cwt. valued at £153,988 in 1946. Production rose from 5,724,613 lb. for the year ending 30th June, 1946, to 6,336,030 lb. for the year ending 30th June, 1947, and the average pay-out for 1st grade butter fat from Sh. 1/50 per lb. to Sh. 1/72 per lb.

Cheese.—409,528 lb. of cheese were manufactured by Kenya Co-operative Creameries during the year ending 30th June, 1947, and sold at an average price of Sh. 1/38 per lb.

Exports were 898 cwt. valued at £6,614.

Clarified Butter.—Production for year ending 30th June, 1947: Non-native 82,718 lb.; Native 1,157,148 lb.

Eggs.—Controlled marketing of eggs continued throughout 1947 in Nyanza Province, but was abandoned in Central Province. A total of 12,272,868 eggs, almost the same as in 1946, was marketed, the value to the producer being £50,693.

Hides and Skins.—Exports during the year were:—

	Cwt.	*Value*
Hides (shade dried)	21,980	£277,696
Hides (sun dried)	9,810	£67,927
	Number	*Value*
Skins (shade dried)	1,392,149	£211,655
Skins (sun dried)	1,051,632	£118,100

The total value was almost twice that of 1946, mainly accounted for by three times the number of skins being bought in 1947.

Poultry.—Sales in Central Province increased from 209,121 head valued at £22,385 in 1946 to 317,508 head valued at £37,941 in 1947. Nyanza Province sold 26,363 head valued at £2,815.

Slaughter Stock.—The following are the figures of live stock bought for slaughter by the Meat Marketing Board during the years 1946 and 1947:—

	Non-native		*Native*	
	1946	*1947*	*1946*	*1947*
Cattle (including calves) ..	24,525	24,122	64,260	29,987
Sheep (including lambs) ..	31,751	29,038	—	—
Sheep and goats	—	—	110,163	99,008

Wool.—Exports during 1947 amounted to 9,089 centals valued at £41,846, compared with 6,690 centals valued at £30,156 during 1946.

PRODUCTION IN NATIVE AREAS

In Nyanza and Central Province cultivation for the main crops was somewhat hampered by the unusually early onset of the rains, and subsequent cultivation was greatly impeded by the heavy rains of April and May, with the result that much of the cereal crop suffered from delayed weeding. In some areas there

was considerable damage due to waterlogging and, consequently, the staple food crops in parts of Nyanza were below average; at the end of the year it was likely that local food shortages would develop during 1948. Central Province, on the other hand, had the best main crops for several years, and although the short rains were inadequate, the food situation at the end of the year indicated that little, if any, shortage would occur provided the 1948 rains were normal.

At the coast crops were only fair and there was a probability at the end of the year that local food shortages would develop in 1948.

Table D gives figures for the three provinces of the more important crops and animal products. These of course represent only the surplus marketed after the requirements of the producer have been met, and in most cases represent but a small fraction of the total production. Only crops marketed through the Maize and Produce Controls, or which undergo produce inspection, are susceptible of accurate recording, others such as vegetables, fruit, etc., can only be estimated.

Provincial details of production and comparisons with 1946, are incorporated in the Annual Reports of the Senior Agricultural Officers in Part III.

LOCUSTS

Escapes from the twelfth campaign against the Desert Locust (*Schistocera gregaria*) which ended on 13th January, 1947, were almost negligible.

Some small swarms entered the country from Somalia and crossed the Northern Frontier District in a northerly direction. It is believed that they moved into Borana, Ethiopia, leaving Kenya clear of locusts at the end of February. Others appeared in Mandera, Moyale and Marsabit districts but disintegrated to a marked extent—possibly because of heavy rains. Layings occurred in Marsabit and Moyale districts, and gave rise to the *Thirteenth Destruction Campaign.* Hatchings, however, were scattered and only small-scale action was necessary. It will be clear (from reference to the 1945 and 1946 reports) that this was not comparable with the great campaigns of past years.

Destruction began on 13th March, and ended on 20th June.

The infested area was less than 150 square miles.

European staff involved consisted of three scouting and control officers and one entomologist. Labour forces were made up of 126 paid and 20 unpaid Africans. Three hired trucks, used mainly for scouting worked a total of 54 lorry days, and were assisted by two Government trucks and some camels.

The few escapes showed no tendency to swarm and were quite negligible.

Successful campaigns in Somalia and British Somaliland brought the locust population of East Africa to its lowest level since the beginning of the outbreak in 1942. No further swarms invaded Kenya at the time of the short rains and no campaign was needed.

At the end of the year it appeared that the outbreak of the Desert Locust in East Africa was virtually over and the threat to food production in Kenya had been removed. It is not possible to assess the amount of food crops saved by locust control measures in the war years but undoubtedly local famine would have resulted at a time when resources were strained to the utmost if action to destroy locusts had not been taken.

With the present world food shortage constant vigilance is necessary to prevent further outbreaks, and the most economical way to accomplish this would be to keep down locust numbers in the outbreak areas in the Red Sea coasts and elsewhere.

A Desert Locust Survey Organization has been proposed to deal with this and should its efforts meet with success further large-scale control measures may be unnecessary in East Africa.

TABLE D

PRODUCTION IN NATIVE AREAS—1947

QUANTITIES AND VALUES OF MORE IMPORTANT PRODUCTS MARKETED (PARTLY ESTIMATED)

	Unit	Nyanza Province		Central Province		Coast Province	
		Quantity	Value	Quantity	Value	Quantity	Value
			£		£		£
Maize and Maize Meal	200 lb.	672,044	317,038	180,936	99,514	16	25
Millets (including Sorghum)	200 ,,	40,239	28,497	22,546	16,401	—	—
Wheat	200 ,,	2,218	3,093	1,173	1,216	—	—
Rice (Paddy)	150 ,,	4,647	4,109	—	—	17,920	26,400
Pulses	200 ,,	9,501	18,929	104,557	195,041	650	8,879
Potatoes	180 ,,	688	366	52,188	33,608	—	—
Cashew Nuts	Cwt.	—	—	—	—	18,000	10,080
Cassava	125 lb.	24,948	6,237	—	—	—	—
Coffee	Cwt.	767	3,701	261	1,765	—	—
Cotton (Seed Cotton)	100 lb.	53,355	48,239	—	—	14,616	17,400
Copra	Tons	—	—	—	—	1,300	39,000
Groundnuts	180 lb.	19,458	25,464	—	—	—	—
Sesame	180 ,,	903	975	—	—	—	—
Tobacco, Green Leaf	Cwt.	—	—	10,583	2,939	—	—
Tobacco, Native Cured	,,	—	—	3,101	6,465	493	1,937
Vegetables, Flowers and Fruit	—	—	8,500	—	146,330	—	27,869
Wattle Bark	Tons	465	3,255	25,915	187,158	—	—
Ghee	Fras. of 36 lb.	30,177	36,238	1,966	1,308	—	—
Eggs	1,000's	3,658	13,829	8,614	36,864	—	—
Miraa (*Catha Edulis*)	—	—	—	—	92,973	—	—
Poultry	Head	26,363	2,815	317,508	39,941	—	—
TOTAL			£521,285		£861,523		£131,590

PART II—POLICY AND THE WORK OF THE DEPARTMENT OF AGRICULTURE

GENERAL

With the continued necessity for the maximum production of foodstuffs, the agricultural policy has had to remain the same as the Colony was forced to adopt during the war period. The continuation of this policy is having a serious effect on the fertility of the land and already large areas in both non-native and native areas are becoming virtually impoverished and will take many years to rehabilitate. It is thus of paramount importance that the unavoidable policy of continuous cropping as at present employed must give way to sound agricultural practice at the earliest possible date if the whole economy of the Colony is to be preserved. In non-native areas the continued lack of supplies of agricultural materials and implements and the dearth of good foundation stock is a primary cause in land deterioration. Given these essential requirements it would be possible to intensify farming methods thus permitting a restoration of soil fertility without affecting production. In native areas the position is more complicated and is influenced by the price now being paid to the producer for his crops, especially cereals.

In spite of these difficulties there has, however, been a growing consciousness of the position in both non-native and native areas. In non-native areas all the available plant of the Soil Conservation Service has been kept fully employed terracing and much soil conservation work has been carried out by individual farmers themselves. In native areas terracing and manuring have made considerable progress and large areas of steep slopes have been closed to cultivation and grazing. Much has been done but still more remains to be done if the Colony's greatest asset—the land—is to be saved.

It has long been realized that animal husbandry must play a very much more important role in the agricultural practice in both non-native and native areas of the Colony if maximum production combined with retention of soil fertility is to be achieved but unfortunately the implementation of this policy has been regrettably slow owing to the reluctance of a number of farmers, both European and African, to accept the Cattle Cleansing Ordinance, owing to the dearth of good foundation stock, and owing to the Colony's lack of knowledge of pasture improvement and management. Until these three obstacles can be overcome, planned agriculture in its widest sense will be difficult to achieve.

DEPARTMENTAL

Continued shortage of staff, more especially trained technical staff, has seriously limited the activities of the Department during the past year. The Soil Conservation Service has done good work and it may be said that the presence of the staff of this service in both non-native and native areas is generally welcomed by the farming community. Departmental extension officers have been available for advisory services in most parts of the Colony but the research and investigational work of the Department has again made little progress owing to inadequate facilities and lack of staff. The primary function of a Department of Agriculture must be to ascertain the facts through a strong and well organized research and investigational section if the extension officers are to be of the greatest value to the farming community. Until such time as it is possible to recruit additional research officers and funds are made available to provide these officers with adequate facilities to carry out their work, it will not be possible for the Department to give its best to the Colony.

EXPERIMENTAL WORK

Pyrethrum.—During the year the headquarters of the Agricultural Officer, Pyrethrum Services, was transferred from Molo to Ol'Joro Orok, the Pyrethrum Assistant being posted to Molo.

Thirty statistical trials, most of them planted during 1946, were picked during the year. Trials of the High Toxic strain (14 x 24) continued and in general results confirmed last year's findings, particularly that this strain is not suitable for altitudes below 7,500 ft. The breeding of new High Toxic strains was continued in collaboration with the Senior Plant Breeder, and testing of several of them was begun. No very definite results have yet been obtained from the application of fertilizers, although it is possible that on some soils phosphates may give improved yield; only on very acid soils has lime proved beneficial, on any others it tends to depress the yield. Observational work on Bud Disease (*Ramularia*) continued and there are indications that some plants are comparatively resistant and that it may be possible as a long-term project to develop resistant strains.

The Senior Agricultural Chemist carried out an investigation into the efficacy of pyrethrum powder for protecting grain against damage by grain-eating insects, and established the fact that pyrethrum powder alone, or in a mixture with diatomite as low as 30 per cent, gave good protection. Further experiments are being made to determine the smallest amount of pyrethrum powder necessary per 200 lb. bag of grain.

The Agricultural Chemist (Pyrethrum) continued work on the diminution of toxicity in baled pyrethrum, and carried out a large number of routine tests on samples for export and on material submitted in relation to breeding of improved strains.

Coffee.—Development of the new research station at Ruiru continued throughout the year and although the main laboratory and administrative buildings could not be started, three staff houses were finished and four more begun, and part of the staff took up residence.

The programme of investigational work was continued at Ruiru and at the sub-station at Kitale; Kentmere Estate and Anmer Estate, Kiambu; Karimani Estate, Thika; Kitito Estate, Makuyu; and Kapretwa Estate, Elgon.

As the post of Entomologist remained vacant, any entomological work which could be done devolved on the Officer in Charge (Coffee Services), and the amount of time it was possible to devote to it was naturally limited. The control of mealy bug by biological means was generally satisfactory although there were localized cases of failure due to the suppression of the introduced parasite by a hyperparasite (*Pachyneuron* sp.). The activities of the Plant Pathologist and Physiologist were restricted by his having to act for the Senior Plant Pathologist while the latter was on overseas leave, but his studies on the measurement of soil moisture and on coffee growth and flowering were continued, as were the investigations into the anatomical changes accompanying flower bud development and differentiation. A detailed comparison of the effect of Raoeng pulping with that of normal fermentation on coffees from the Upper Kiambu area was undertaken.

The Agricultural Chemist carried out cultivation, manurial and uniformity trials at the Coffee Research Station, the results of which suggest that the two most important field factors in unshaded coffee are cultural treatments influencing soil moisture and the application of nitrogen fertilizers.

Vegetative propagation of coffee was continued on an increased scale and a very successful technique developed for the production of rooted cuttings under local conditions.

Sisal.—A full-time Agricultural Officer, Sisal Services, was appointed during the year and in addition to the programme of investigational work already approved, it was decided to extend some of the more important trials to subsidiary stations at Kitale, Nakuru, Voi and two in the Thika area. These will be concerned mainly with spacing of rows, plant density per acre, earliness of cutting and frequency of cutting.

Cereals.—At the Scott Agricultural Laboratories selection work was re-started on Muratha maize; five varieties of imported hybrid maize were planted but did not do very well. Eight selected wheat crosses were sown for multiplication.

At the Plant Breeding Station at Njoro, stocks of 117A selected wheat were increased to 270 bags in readiness for bulking during the coming season. One new wheat 294.M.7.L.6.A. was released: This is a cross between 26A and 117A and is an improvement of 291.J.1.I.1 both in milling quality and range of altitude over which it can be grown. 2,700 bags were available for 1948 sowing.

Five new wheats were under multiplication, trials of others were carried out at Molo and Njoro.

Selection work continued, the main characters aimed at being disease resistance combined with good straw strength, milling and baking quality and yield.

New importations came from Australia (five) and United Kingdom (eighteen), the latter proving quite unsuccessful under Kenya conditions.

The Senior Plant Pathologist continued the maintenance of the seven physiologic forms of wheat stem rust so far encountered, and tested twenty-three new hybrids for resistance.

Potatoes.—The Senior Plant Pathologist continued his work on the multiplication and testing of blight-resistant potatoes. The 914 series has proved to be the most popular, and so far all reports of the blight-resistant varieties having been attacked, have turned out on examination to be unfounded. Other varieties being multiplied are 835 a (4), Salaman Clarke 2 and Dutch Robyjin. The last is highly resistant but not immune and maintains its popularity by virtue of its comparatively heavy yields.

Pasture.—In the main, research work has been confined to co-operative experiments on farms, attention being devoted to study of methods of management of various types of natural grassland. Grasses already in use for temporary leys are the Nzoia strain of Rhodes grass (*Chloris gayana*) for the areas from 4,000 to 6,500 ft. and *Bromus marginatus* for the higher altitudes. Four other grasses, *Pennisetum stramineum*, an erect form of *Cenchrus cilaris*, an ecotype of *Melinis minutiflora* and a *Setaria* sp. have shown some promise in preliminary trials. So far little progress has been made in the search for pasture legumes for use as a mixture with ley grasses.

Scott Agricultural Laboratories.—Results of trials of some of the selective weedicides were somewhat inconclusive but experiments will be continued when more material is available. The fumigant effect of Gammexane remarked on in last year's annual report was confirmed; on mustard, dressings of 5 per cent Gammexane dust at the rate of 40 lb. per acre at intervals of three and six weeks after planting gave complete protection against sawfly, even when the dust had been washed off by rain.

A number of bean and pea varieties were under observation but have so far showed no improvement over local varieties; work on these continues. Safflower planted for multiplication was disappointing, coriander did well but dill and carraway failed. On the soil side a suitable technique for the assessment of crumb structure was worked out; and investigations into the possibility of the small-scale manufacture of silicophosphate on farms were brought to a successful conclusion. Further work on land utilization surveys was carried out in connexion with the Tana River irrigation project, the Shimba and Chyulu Hills and the Makueni settlement.

Entomological work was impeded by the absence of the Senior Entomologist on leave for the greater part of the year. The operation of the Plant Protection Ordinance was controlled by this section and there was an increase in the number of plant importation permits issued; the prohibition of the importation of herbaceous ornamental plants continued throughout the year. Legislation to

prohibit maize planting between certain dates and to enforce the burning of maize and sorghum residues was again introduced in order to combat the considerable increase of stalk-borer.

The main lines of work of the Senior Plant Pathologist have already been dealt with under "Crops"; in addition a great deal of work was done in identifying material received from the Forest Department in connexion with root rot of timber trees, decay of timber and damping off of seedlings. Virus disease of sweet potatoes, which is considered a menace in the Belgian Congo and Uganda, has not attained serious proportions in Kenya.

Plant Breeding Station, Njoro.—In addition to the work on wheat mentioned above, seven varieties of barley were again under trial of which two Kenia and German, have now been discarded as unsuitable; Research, Mariout and Glacier showed themselves superior to Prior. Eight new varieties were imported, and one of them—Prefect—showed some promise.

Of the six new varieties of oats from Canada referred to in last year's report, two have showed some resistance to stem rust and are being carried on. A recent importation from New Zealand—Achilles—will be released in 1948 if it continues to be satisfactory, it is, however, a feed rather than a milling oat. Nineteen new varieties from Cambridge turned out to be completely unsuccessful and had to be discarded, and ten American and Canadian varieties were all infected with stem rust to some extent.

Preliminary results of imported hybrid maize varieties indicated that they are unlikely to be of use here, and it is probable that any work on these lines will need to be done *ab initio* in Kenya, if it is to be successful.

Experimental Stations.—Kitale and Ol'Joro Orok: At Kitale the rotation as planned last year was followed with a few minor alterations. At Ol'Joro Orok, European and African housing was completed in March and the staff took up residence. The Ngata pyrethrum drier came into use and was satisfactory. Heavy hail in July resulted in partial destruction of most of the crops and yields were poor.

FRUIT

The establishment of the experimental station at Molo made progress during the year, a further consignment of rootstocks was imported from East Malling, and of trees on experimental rootstocks from Stellenbosch. The orchard was extended but investigation work was held up by the absence of the Agricultural Officer (Horticulture) on leave during the last eight months of the year.

VEGETABLE SEED PRODUCTION

The Seed Specialist retired at the beginning of the year and the Seed Station at Turi was subsequently closed down. The commercial side of the organization of vegetable and flower seed production is now in the hands of the Kenya Seed Growers' Association, whose address is c/o The Kenya Farmers' Association (Co-operative), Ltd., Nakuru.

EXTENSION WORK

Non-native Areas.—The requirements of the Increased Production of Crops Ordinance still occupied a large part of the time of agricultural officers in European areas, but it is becoming possible to devote an increasing amount of time in most areas to experimental and advisory work. Some progress is being made in changing over from cereal monoculture to sounder methods of farming, and it is gradually becoming realized by the majority of farmers that alternate husbandry is essential if the land is to be maintained in good heart.

Native Areas.—With the increase of agricultural and marketing staff throughout most of the reserves there has been an opportunity to reorientate the efforts of field officers towards the permanent objective of inculcating a better use of

the land. Unfortunately in the maize-growing areas the tendency of the African is still to increase the acreage in an unavailing attempt to counteract the effects of decreasing yields. The objects of soil conservation and the need for it, are gradually beginning to make some impression on the mass of Africans, but apathy and a disinclination to personal effort still leaves it very much at the mercy of agitators whose incitements to refrain from physical work find a considerable measure of popular support.

The problem of reconciling the need for increased production of cereal and other crops with the necessity in many native areas for a more balanced form of agriculture has made little progress, if any, towards a satisfactory solution.

Some success has been achieved during the year in fostering the use of manure in some of the reserves but much remains to be done before the making and use of manure attains its proper place in African agriculture.

SOIL CONSERVATION

Further additions to the European staff took place during the year, 18 assistant soil conservation officers being engaged of whom eight were posted to European areas. The purchase of five new tractors, although insufficient to meet requirements, has helped to expedite work. 7,487 acres were broad base terraced and 321 acres narrow base terraced, 162,500 cubic yards were excavated by hand-work, 45 miles of outlet and cut-off drains constructed, and 45 miles of road made. Twenty-two dams with a capacity of 976 acre feet were built in the Plateau and Thomson's Falls area and at the end of the year there was a long waiting list of applicants in many districts. Inspection services were maintained throughout the year and a considerable acreage of land was closed to further cropping, mainly in the Trans Nzoia and Uasin Gishu districts. A great deal more remains to be done in these and other districts, but re-grassing of exhausted arable land cannot proceed to the extent it should until adequate supplies of suitable grass seed are available.

Development of the Kitale, Lumbwa and Thomson's Falls stations continued but no decision has yet been reached with regard to the general headquarters, or the Nairobi district station and no permanent buildings have yet been constructed at Nakuru.

While there have been no major setbacks in Nyanza Province, progress in soil conservation continues to be slow, with steady advances in some localities in achieving the support of the people. Technique continues to improve and manuring is increasing, but the care and improvement of the soil is still unfortunately secondary to the continual need for producing cereal crops for subsistence and surplus. Two dams were made in Central Kavirondo and it is hoped to increase the scope of this work considerably in 1948.

In Central Province there was a great deal of local political opposition to soil conservation work in the Fort Hall District during the third quarter of the year which resulted in terracing being brought to a complete standstill for a time; some recovery was made before the end of the year. Elsewhere in the province there was satisfactory progress in soil conservation and grassing down of eroded areas. Manuring continued to increase in popularity and although much of it is still dependent on importations there are signs that the land-holders are gradually appreciating the need to make more use of their own stock.

With the posting of extra European staff to the Coast Province, there has been an added impetus to the drive to check soil erosion and some progress has been made. There is still room for a large increase in the use of manure and in grass plantings on abandoned arable land and eroding hillsides.

In general it may be said that throughout most of the Colony there is an increasing awareness of the necessity for soil conservation, and better farming

methods, both in the European areas and African reserves. The main limiting factor is still the need for adequate European staff and for a higher standard of training among the African staff, to permit of an increase in the advisory and inspection services and an intensifying of propaganda.

AGRICULTURAL EDUCATION

At the Egerton School of Agriculture the second Agricultural Certificate course was held during the year and comprised some sixty students, including settlement candidates, Government officers and private students. Their wives were admitted free of charge to the Certificate course and also given instruction in one or two extra subjects.

On the school farm the cattle and pigs did well, poultry were rather disappointing and sheep suffered from the very wet weather. Maize, wheat, barley, oats, linseed, pyrethrum, field peas, oat hay and maize silage were grown on the 240 acres of arable, and an equal acreage was down to temporary leys.

African agricultural education, directed almost entirely to producing field staff for the department, continued at Embu and Bukura, with a short course for ex-service candidates at Centre "C", Kabete. Work was begun on the staff quarters and school buildings at Maseno, which is to replace Bukura as a training school; at Embu the new farm buildings were completed.

PRODUCE MARKETING AND INSPECTION

Marketing and inspection of produce continued smoothly throughout the year in spite of the usual difficulties with transport, and the unfortunate situation brought about in Central Province by a very wet season coinciding with very heavy stripping of wattle bark, induced by high prices. Marketing officers who are now acquiring a background to their duties and an interest in them are beginning to take a considerable amount of work off the hands of the agricultural officers, and provided the right type of personnel can be maintained they will undoubtedly fulfil a very useful function and leave agricultural officers free to spend more time on their proper duties.

There are demands by the Africans in some areas for many more produce-buying licences to be issued than the amount of produce to be bought warrants, and any attempt to keep them to a number likely to allow of a reasonable profit, is frequently looked upon as an unjustifiable restraint.

There is a pressing need for the correlation of prices of all types of produce not only in accordance with the requirements of the country for certain kinds of foodstuffs, but within themselves as an encouragement to a more balanced form of African agriculture.

GRADING, INSPECTION AND COOL STORE SERVICES

During the year 717,180 bags of maize from different sources were graded of which 33,439 were rejected, about one-third as wet and two-thirds as weevily. Of the graded maize rather more than 40,000 bags was K.3 SW. but the majority was K.8.

10,675 bags of soya beans, 5,916 bags of white haricot beans and 1,506 bags of mixed beans were graded during the year.

Potatoes were at first of a higher quality than for some years, but after April there was a decided deterioration which continued until export ceased in July owing to the internal shortage. 42,210 cwt. were graded for export.

Wheat grading took place from March to August and the standard was generally up to K.1; in all 194,365 bags were received, of which 13,779 were rejected, nearly all as weevily.

The maize conditioning plant dealt with over 400,000 bags of various grains during the year, working in all 9,335 hours. In Nairobi the grain conditioning plant dealt with 383,600 bags of maize in 5,818½ working hours.

The Cool Stores, Kilindini, operated satisfactorily throughout the year, deposits amounting to 1,680 tons, a slight increase on the previous year. Importation of fruit was greatly reduced and most other commodities showed a decline, the difference being made up by a large increase in the amount of fish deposited.

LIBRARY

The work of bringing the library up to date was continued in 1947. One hundred and ninety books were added to the library and the number of periodicals taken was increased, both by new subscriptions and by the revival of journals which had ceased appearing during the war. A notice was published in the K.I.O. Fortnightly in October bringing the library's lending facilities to the notice of the public, which brought in many inquiries. In all 57 new depositors joined the library.

PUBLICATIONS

The following is a list of articles contributed by departmental officers to the *East African Agricultural Journal*, the *Monthly Bulletin of the Coffee Board of Kenya* and the *Kenya Pyrethrum News*:—

East African Agricultural Journal

VOL. 12—JANUARY-APRIL.

"The Home Orchard"—T. H. Jackson, Assistant Agricultural Officer.

"Soil Conservation Organization in Fort Hall District as Adapted from the Indigenous 'Ngwatio' System"—J. Hughes Rice, Assistant Agricultural Officer.

"Erosion in the Punjab" (review)—C. Maher, Senior Soil Conservation Officer.

VOL. 13—JULY-OCTOBER.

"A Description of an Easily Made Hard Pressed Cheese"—M. A. Barrett, Agricultural Officer.

Coffee Board Bulletin

"Coffee-tree Banding for Mealy Bug with a Sprayed D.D.T. Emulsion"—S. Gillett and H. Pereira (Coffee Services).

"D.D.T. for the Protection of Coffee Drying Ground Sheets"—H. Pereira, Agricultural Chemist (Coffee Services).

"A Reminder on Spraying for Thrips"—A. R. Melville, Entomologist (Coffee Services).

Annual Report of the Plant Pathologist and Physiologist (Coffee Services). (Reprinted from the Departmental Annual Report, 1945.)

Phosphatic Fertilizers for Kenya Coffee"—H. C. Pereira, Agricultural Chemist (Coffee Services).

"The Trusty Tractor"—(Report by the Agricultural Chemist, Scott Agricultural Laboratories).

"Yellowing Symptoms in Coffee"—Plant Pathologist and Agricultural Chemist (Coffee Services).

"Boma Manure and Liquor"—H. C. Pereira, Agricultural Chemist (Coffee Services). (Letter.)

"D.D.T. Spray-Banding for Mealy Bug"—H. C. Pereira, Agricultural Chemist (Coffee Services).

"Antestia and D.D.T."—Note by the Senior Coffee Officer.

"Coffee Preparation"—E. Cottington, Senior Assistant Agricultural Officer.

Kenya Pyrethrum News

"Preparation and Management of Pyrethrum Seed Beds"—H. C. Thorpe, Senior Plant Breeder.

"The Improvement of the Quality of Pyrethrum"—E. W. Gaddum, Agricultural Officer (Pyrethrum).

"Some Reflections on the Bud and Flower Disease of Pyrethrum"—E. W. Gaddum, Agricultural Officer (Pyrethrum).

"Does it Pay to Interplant Pyrethrum?"—U. Kroll, Pyrethrum Assistant.

"The Spacing of Pyrethrum Plants"—E. W. Gaddum, Agricultural Officer (Pyrethrum).

"Some Hints on Transplanting Pyrethrum in the Field"—U. Kroll, Pyrethrum Assistant.

"Some Miscellaneous Notes"—E. W. Gaddum, Agricultural Officer (Pyrethrum).

"Fertilizers and Pyrethrum"—E. W. Gaddum, Agricultural Officer (Pyrethrum).

"Investigations on Petal-less Pyrethrum Flowers"—U. Kroll, Pyrethrum Assistant.

"Blind Plants"—E. W. Gaddum, Agricultural Officer (Pyrethrum).

"Protection of Grain against Weevils"—V. A. Beckley, Senior Agricultural Chemist.

"Chemical and Biological Valuation of Pyrethrum"—V. A. Beckley, Senior Agricultural Chemist.

"Housing for African Labour and Instructors at Molo Experiment Station"—U. Kroll, Pyrethrum Assistant.

Other publications by members of the department which appeared during the year were:—

"The Liguru and the Land"—N. Humphrey, Senior Agricultural Officer.

"Pyrethrum Experimental Work, 1944-46", "Pyrethrum Experimental Work, 1946-47"—E. W. Gaddum, Agricultural Officer (Pyrethrum). Published by the Pyrethrum Board.

"A Disease of Pyrethrum in Kenya"—R. M. Nattrass, Senior Plant Pathologist. *Nature* Vol. 160, pp. 120-1.

"*Monochaetia* cankers of *Cupressus* in Kenya"—R. M. Nattrass and A. Ciccarone, *Empire Forestry Review*, 26, 2, 289 (1947).

AGRICULTURAL LEGISLATION

The following comprise the more important legislative changes affecting agriculture during 1947:—

Coffee (Marketing) (Amendment) Ordinance, 1947.—Re-words paragraph (*a*) of sub-section 2 (sale in the United Kingdom) and extends operation of Ordinance to 1952. The original Ordinance (Coffee Marketing Ordinance, 1946), was brought into force on 1st July, 1947.

Coffee Marketing Rules, 1947.—Prescribe the form of returns for parchment coffee to be submitted for curing; make it necessary to obtain a permit to deliver coffee for curing; prescribe the statement to be sent to the Board, the

classification of coffee by the Board and payments to be made; lay down the procedure for election of members to the Board, the Joint Standing Committee and the Advisory Panel.

Passion Fruit Rules, 1947.—Deal comprehensively with growers' returns, factory permits, conditions under which factories may accept and growers sell passion fruit; grading and inspection of fruit; disposal of passion fruit juice; commission fees; submission of statement of account and agency operations; arrangements for Conference; Passion Fruit Rules, 1938, and Amendment Rules, 1939, revoked.

Wattle Bark (Improvement and Inspection) (Amendment) Rules, 1947.—Prescribe that no bark shall be delivered between 6 p.m. and 6 a.m.; Central Province added to the Schedule, with places of inspection therein.

Wattle Bark (Improvement and Inspection) (Amendment No. 2) Rules, 1947.—Lay down regulations for the stripping, movement and inspection of bark.

Other legislation enacted during the year was as follows:—

Ordinances

An Ordinance to Amend the Tea Ordinance, 1934.

An Ordinance to Amend the Sisal Industry Ordinance, 1945.

Rules and Regulations

Defence (Control of Eggs) (Central Province): Revoked; Defence (Control of Export of Tea): Order, 1947; Defence (Control of Marketing and Export, Hard Coffee), 1942: Revoked; Control of Maize Regulations, 1944: Order *re* movement, price of; Increased Production of Crops Ordinance, 1942: Linseed declared a crop; guaranteed f.o.r. prices for linseed and maize; Guaranteed Minimum Returns and Grants Rules, 1947; Harvesting Returns; marketing instructions to agents; planting programme, 1947; Price of Wheat, Barley and Oats Order; value of crops retained. Maize Subsidy Repayment Ordinance: Suspension of operation. Miraa Control Ordinance: Date of operation 1-4-47. Pig Industry Ordinance: Convening of Annual Conference of Delegates Rules, 1947; *Quota of Pigs Rules*, 1947. Plant Protection Ordinance, 1937: Maize and sorghum planting dates; maize and sorghum, destruction of stalks; order *re* plants and seeds imported; Rules, 1947 (new rules concerning maize and sorghum; administrative district of Nandi included in schedule). Pyrethrum Ordinance, 1938: Regional Meetings of Growers (Amendment) Rules, 1947. Pyrethrum (Amendment) Ordinance, 1943: Continuation in force until 31-12-49. Sisal Industry Ordinance, 1945: Levy of cess. Tea Cess Ordinance, 1937: Cess on manufactured tea.

STAFF

The department suffered a serious loss in May by the promotion of the Deputy Director, Mr. A. B. Killick, to be Director of Agriculture, Uganda. Mr. Killick joined the department on transfer from Tanganyika in 1941 and since that date has several times acted as Director as well as being seconded as Maize Controller during a difficult period in 1944. Mr. W. O. Sunman, Assistant to the Director, acted as Deputy Director from May until the end of the year.

The staff of the department continued to be considerably below the established strength during 1947; this was particularly the case in respect of the Colonial Agricultural Service, as apart from two Pasture Research Officers no new appointments in this category were made during the year, while on the other hand there was a number of retirements of officers with long service and other losses.

Mr. V. A. Beckley, O.B.E., M.C., Senior Agricultural Chemist, retired in December after being in charge of the department's Chemical Services for 23 years. Mr. C. O. Oates, Senior Agricultural Officer, retired in November after

20 years' service, mainly in native areas. Mr. W. F. Sargent retired in August after 21 years' service with the department as Superintendent of the Grain Conditioning Plant and Cool Stores, Kilindini.

Mr. S. Gillett, Senior Coffee Officer, was seconded as Commissioner for European Settlement from February until the end of the year. Mr. W. Lyne Watt, M.B.E., Senior Agricultural Officer, was seconded from the department on promotion as Provincial Agrarian Development Officer, Nyanza, from June.

Mr. A. E. Pound, Agricultural Officer, returned from his secondment to Seychelles, and other additions to the field staff include 20 Assistant Agricultural and Assistant Soil Conservation officers, most of these appointments being on contract in connexion with the D.A.R.A. Soil Conservation Scheme. Losses included Mr. J. F. Ward, Agricultural Officer, transferred on promotion to Nigeria, and nine other officers by resignation.

The Director continued to serve throughout the year as Chairman of the E.A. Anti-Locust Directorate and Dr. Le Pelley remained a member.

This report is signed by me as Mr. Blunt left the Service on leave pending retirement before its completion. Agricultural bodies throughout the Colony have already paid tribute to Mr. Blunt's sterling work for the Colony during his eight difficult years as Director of Agriculture and this report would be incomplete if it failed to add the tribute of the whole department to thank Mr. Blunt for the patience and sympathy he showed to each officer of his staff who was privileged to serve under him during the war years.

STUART GILLETT,
Acting Director of Agriculture.

PART III—SECTIONAL REPORTS

ANNUAL REPORT OF THE SENIOR AGRICULTURAL OFFICER, NYANZA PROVINCE, 1947

Staff

(*a*) *Europeans.*

KISUMU—

Mr. J. F. Ward, Ag. S.A.O.: 1st Jan. to 1st July.
Mr. P. C. Chambers, S.A.O.: 31st July to 31st Dec.
Mr. J. T. Moon, A.O.: 1st Jan. to 15th Feb.
Mr. J. F. Dearden, A.A.O.: 1st Jan. to 30th April.
Mr. J. W. Gurr, A.S.C.O.: 1st May to 15th Sept.
Mr. A. W. Allen, Clerk I: 15th Oct. to 31st Dec.

KAKAMEGA—

Mr. C. W. Anderson, A.O.: 1st Jan. to 31st Dec.
Mr. G. M. Lavers, A.A.O.: 1st Jan. to 15th June.
Mr. G. D. M. Bailey, A.S.C.O.: 15th June to 31st Dec.
Mr. J. C. Todd, A.S.C.O.: 17th Sept. to 31st Dec.
Mr. D. C. Marshall, Marketing Officer: 1st Jan. to 31st March.
Mr. B. R. Dudin, Marketing Officer: 20th May to 31st Dec.

KIMILILI—

Mr. P. Thoms, A.A.O.: 2nd Dec. to 31st Dec.

MASENO—

Mr. G. C. Javens, A.A.O.: 1st Jan. to 9th May.
Mr. J. W. Gurr, A.S.C.O.: 17th March to 30th April.
Mr. A. W. Thompson, A.O.: 30th April to 13th Oct.
Mr. A. E. Pound, A.O.: 5th Oct. to 31st Dec.
Mr. N. K. Whitton, A.A.O.: 1st Nov. to 31st Dec.
Mr. J. W. Duthoit, A.S.C.O.: 27th Nov. to 31st Dec.
Mr. A. H. F. Scott, Marketing Officer: 1st Jan. to 31st Dec.

KISII—

Mr. A. F. Nichols, A.O.: 1st Jan. to 28th Oct.
Mr. A. W. Thompson, A.O.: 14th Oct. to 31st Dec.
Mr. P. Thoms, A.A.O.: 1st Sept. to 30th Nov.
Mr. J. R. Clarke, A.S.C.O.: 7th Nov. to 31st Dec.
Mr. J. M. K. Slater, Marketing Officer: 1st Jan. to 31st Dec.

KERICHO—

Mr. G. Gamble, A.O.: 1st Jan. to 31st Dec.
Mr. J. P. Dallas, A.S.C.O.: 24th Dec. to 31st Dec.
Mr. F. F. Sheldrake, Marketing Officer: 7th Jan. to 31st May.
Mr. W. M. Blow, Marketing Officer: 23rd Sept. to 1st Dec.

BUKURA—

Mr. E. L. Bradford, S.A.A.O.: 1st Jan. to 19th June.
Mr. G. M. Lavers, A.A.O.: 16th June to 31st Dec.

LUMBWA—

Mr. S. S. Brugh, A.S.C.O.: 1st Jan. to 14th Sept.
Mr. G. H. Dukes, A.S.C.O.: 15th Sept. to 31st Dec.

(*b*) *African*—

Designation	*A.D.*	*L.N.C.*	*Total*
Agricultural Assistants	2	—	2
Clerks	8	3	11
Instructors	194	353 (Asst. Inst.)	547
River Scouts	36	—	36
Produce Inspectors and Market Staff ..	9	131	140
Labour	110	126	236
Artisans	1	—	1
Temporary Soil Conservation Staff ..	—	30	30
Tree Nursery Staff	2	117	119
Teachers	2	—	2

Seasonal Conditions

The long rains were early and extremely heavy with much flooding on the heavier low-lying soils and some very heavy hailstorms. The short rains were very poor.

Rainfall

	Average Rainfall (B.E.A.M.S.)	Number of Years Recorded (B.E.A.M.S.)	1947
	Inches		*Inches*
North Kavirondo:—			
Kakamega D.C. ..	74·60	25	87·19
Bukura (Agric. Dept.) ..	66·36	22	85·73
Central Kavirondo:—			
Maseno (Agric. Dept.) ..	58·15	5	74·77
Kisumu-Londiani:—			
Kisumu (Met. Station) ..	47·80	7	57·46
Miwani (K.U.R. & H.) ..	49·82	16	48·57
Muhoroni (K.U.R. & H.)	61·77	41	77·93
Fort Ternan (Kipteris) ..	49·10	27	60·95
Lumbwa (K.U.R. & H.)	45·13	41	58·86
Kericho:—			
Kericho (D.C.)	70·91	41	92·17
Sotik (Kwoga Estate) ..	51·90	9	60·74
Sotik (Tenwick Mission)	50·92	6	60·58
South Kavirondo:—			
Kisii (D.C.)	66·81	35	74·07
Murumba	93·06	4	110·41
Rapogi (Catholic Mission)	44·96	2	56·68

European Agriculture

Seasonal conditions were satisfactory in the Kericho–Sotik area, but the heavy rains experienced and the state of the roads made farming operations difficult, particularly deliveries of whole milk. Crops and grazing have generally been good. Tea growing continues to expand in Kericho and is spreading to North Sotik, where a number of nurseries have been established and seedlings are doing well. Some famers are becoming soil conscious, but on many farms particularly in East Sotik soil conservation work is very backward and squatter holdings are a disgrace. A Soil Conservation Inspector is very urgently required.

In the Lumbwa–Songhor–Koru–Fort Ternan area with rainfall badly distributed and 20 to 25 inches above average, it has been a very difficult year.

The coffee crop was generally above average and fair yields of sunn hemp and sunflower and in the Lumbwa area of wheat, oats, and barley were obtained, but maize yields were the worst ever known, an average of two to two and a half bags per acre compared with the usual ten. The heavy rains starting so early precluded the preparation and planting of some fields.

Further small areas were planted with papaws in Koru and Songhor for papain production. On one group of farms in Lumbwa geranium planting is being undertaken on a large scale for essential oil production and results to date are promising. Pig keeping and dairying are increasing, and, in spite of the shortage of fencing wire, considerable progress has been made with fencing and paddocking.

Severe outbreaks of foot and mouth disease occurred in the Songhor area.

The Soil Conservation unit at Lumbwa has been handicapped by shortage of equipment and the lack of an Inspector. The building of the headquarters has progressed very slowly, and the first officer's house has not yet been completed by the Public Works Department. During the year 4.91 miles of broadbase terrace serving 41.27 acres, and 4.98 miles of V type terrace serving 28.28 acres were constructed, also 7,650 feet of cut-off drainage with a total capacity 1,653 cusecs and 4,900 feet of drainage channels with a total capacity of 782 cusecs and 3 miles of farm roads. Earlier terracing on heavy soil is blamed for increasing waterlogging and loss of crop, and mole or other drainage trials are required.

Indian Agriculture

The Kibos–Muhoroni area was under the ægis of the Assistant Agricultural Officer, Kisumu, until September, when the Agricultural Officer, Central Kavirondo, took it over. Production Committee meetings have been attended, but few visits of inspection and advice were possible. Many of the Indians are good farmers, but have been left mainly to their own devices and have suffered economic difficulties in sugar production in recent years. This coupled with the small size of the farms has resulted in considerable absentee farming. The Provincial Agrarian Development Officer with the help of the Assistant Agricultural Officer made a survey of the sugar growing problems, and made recommendations, and the new management of the Miwani Sugar Estates are making determined efforts to improve the condition of their own plantations and to establish sounder relations with cane farmers in the Kibos area.

Drainage and the severe run-off from the Nandi Escarpment are major problems in this area and investigational work on sugar cane is urgently needed together with much more extension advisory work. It is hoped to post an Asian Agricultural Assistant with specialized sugar knowledge to this area in 1948.

With the very heavy rains and flooding this has been a bad year for maize and the number of claims for guaranteed minimum returns has been the highest since planting orders were first issued. Eight thousand four hundred and sixty-five bags of maize were delivered to the Control, and 1,125 tons of jaggery were produced.

African Agriculture

Crops

General.

Except where damaged by hail the lighter soils gave good crops in the long rains and the heavier soils, due to waterlogging, poor crops with in some cases complete failure. With very poor short rains very little crop is promised.

Cotton.

1946–47 Season.—The area planted was estimated at 27,000 acres. The early rain in January made harvesting difficult, vegetative growth and flowering continued and much of the crop was lost.

Purchases of Seed Cotton at 19 cents per lb. "A" and 4 cents "B" Quality:—

	"A" Quality	"B" Quality	Total
	Lb.	*Lb.*	*Lb.*
No. 1 Area ..	3,528,220	93,267	3,621,487
No. 2 Area ..	596,491	25,014	621,505
No. 3 Area ..	884,389	208,091	1,092,480
TOTAL ..	5,009,100	326,372	5,335,472

A decrease of 726,684 lb. on the 1944/45 crop.

Production of Lint in Bales:—

	AR.	BR.	TOTAL
	Bales	*Bales*	*Bales*
No. 1	2,536	63	2,599
No. 2	270	18	288
No. 3	678	143	821
TOTAL ..	3,484	224	3,708

1947–48 Season.—Due to the wet weather and delayed cultivation of food crops, planting was very late. Even in South Kavirondo, where early planting is so necessary, no cotton was planted until late in May and the bulk of the crop was planted late in June and in July. It is estimated that 24,000 acres were planted. Early growth in most areas was promising, but *Lygus* and *Helopeltis* did very considerable damage later, as did hail in parts of the No. 1 area. Stainer infestation was negligible. Buying opened in the No. 3 area only before the end of the year, and 332,729 lb. of first quality cotton was bought at 21 cents per lb.

Coffee.

Arabica.—South Kavirondo.

Area	Variety	At 1st January, 1947		At 31st December, 1947	
		No. of Planters	Acres	No. of Planters	Acres
Bassi	Gethins ..	33	25·82	33	25·82
	J.B.M. ..	15	30·72	15	30·72
Nyaribari ..	Kents ..	1	0·17	1	0·17
	J.B.M. ..	58	51·68	59	51·99
Kitutu ..	Kents ..	1	4·00	1	4·00
	Varieties ..		0·75		0·75
	J.B.M. ..	204	76·13	230	83·33
	TOTAL ..	312	189·27	339	196·78

With much of the coffee work handed over to the Board of the Kisii Coffee Growers Co-operative Society, the interest of the grower in the crop has certainly not increased, and direct action will be necessary to obtain better care and cultivation. The larger plantations are in general the worst tended. With lack of cultivation and weather too wet at times, notably in the second quarter, crops were poor and *Hemeleia* widespread. Coffee berry disease took its usual toll but *Antestia* was considerably reduced in comparison with previous years.

Deliveries to the Co-operative pulping stations during the year amounted to: —

1946–47 Crop: 9,604 lb. Cherry, and 4,547 lb. Buni.

1947–48 Crop: 205,083 lb. Cherry.

The following amounts were dispatched to Nairobi and the following sums of money were received: —

		Sh.	*cts.*
1946–47 Season.			
	31,743 lb. Parchment	25,001	26
	7,200 lb. Buni	166	63
1947–48 Season.			
	47,636 lb. Parchment	35,357	57
	2,585 lb. Buni	903	44
Totals	79,379 lb. Parchment; 9,785 lb. Buni.	Sh. 61,428	90

Oil Seeds.

Groundnuts.—South Kavirondo reports a small increase in planting. Growth was good and yields average, but the nuts were smaller than usual. There was no change in North and Central Kavirondo, where the small quantities grown are largely consumed locally. An effort made to popularize this crop in Lower Kericho was spoiled by excessive rain and damage by stock. On a few holdings the crop did very well.

Simsim.—In North Kavirondo the increase in price resulted in a small increase in acreage over last year, but rice and maize and in South Kavirondo cowpeas and green gram have ousted this crop from its former popularity. Some very good yields were obtained, but in most areas the crop was badly droughted.

Cereals.

Maize, Sorghum and Wimbi.—With the late planting and excessive rain in the long rains maize and mtama yields were generally poor and with very poor short rains yields from these in the areas, where planted, will be negligible. Wimbi yields were also poor with surplus available only from the Kisii locations.

Rice.—In North Kavirondo the wet weather in December, 1946, and January, 1947, hindered cultivation in the swamps, and the area planted was considerably smaller and later than usual. Large areas were washed out and weed growth was severe. At first it was thought that seed requirements only would be harvested, but some improvement at the end produced a small surplus.

In Central Kavirondo apathy was aggravated by flooding and most of the small acreage planted was drowned. Drainage work is urgently required as an adjunct to rice planting on the Kano.

Wheat.—In South Kavirondo the acreage was reduced due to late planting of normal food crops. Yields were fair. In Kericho efforts to encourage wheat growing in the Sotik area met with some success and yields were good. Propaganda for local consumption is producing some response.

Beans and Pulses.

Except for an increase in green gram and cowpeas in South Kavirondo, plantings were similar to previous years, barely adequate for local needs. Soya beans are generally more promising than Canadian Wonder or Rose Coco, which suffer badly from disease, but they are still not popular. Supplies of soya and lima bean seeds were obtained at the request of Africans in North Kavirondo, but on arrival they refused to buy. In spite of continued propaganda to plant legumes to fill local needs plantings in Kericho were still negligible.

Potatoes.

In Kisii, blight and wilt almost wiped out the main crop, and in Kericho a very small area was planted, as the crop is unpopular due to the Control's closure of buying in 1945. Efforts are being made to encourage planting for sale during the periods of shortage.

Root Crops.

The planting and maintenance of cassava and sweet potatoes has again been stressed, but with the exception of a few locations notably in Marach and Buhayo, and to a lesser extent Tiriki, and parts of Marama and Buholo in North Kavirondo, the position is still far from satisfactory. In lifting the crop in the dry weather many are still prone to lose all planting material. In some areas, notably Itesio in North Kavirondo, waterlogging caused rotting and loss. Kericho has had difficulty in finding a sweet potato variety that will set tubers under their conditions.

Vegetables.

Normal supplies of vegetables were provided from Maragoli in North Kavirondo, until the dry weather towards the end of the year.

Ten acres of swamp in South Kavirondo have been drained and used for direct production of vegetables, partly as a swamp utilization trial, and partly to meet the needs of the hospital, schools and the like for fresh vegetables. Production by Africans is increasing in the swamps and on their holdings. Vegetable seeds to the value of £50 were sold to growers during the year. In Kericho vegetables are grown widely and do very well and if an assured market could be obtained this work would expand.

Trees.

Wattle.—In South Kavirondo a number of very small plots were planted, but the total area planted was negligible. The felling of mature plantations for charcoal, firewood and building poles continued. Bark is still considered a sideline and handled by middlemen, who buy plantations from the owners. Approximately 465 tons of dry bark were purchased at Homa Bay during the year and some 20 tons were ready for transporting thither at the end of the year. It is thought that seven-eighths of the total 2,000 acres of estimated plantings have now been felled.

In Kericho little interest was shown in the crop and propaganda for stripping and sale produced no response, due probably to transport costs which would be remedied by having a factory in the vicinity. Fear of increased erosion, if wattle is planted, is frequently mentioned. In the Buret location small individual patches were planted primarily for building poles.

Cinchona.—Losses due to disease of even well grown seedlings were very severe. In Kakamega mortality amounted to 92 per cent and the growth of the remainder was very poor.

Seedlings planted out on the Kisii Farm are making very slow progress.

Other Trees.—South Kavirondo maintained fifty tree nurseries during the year and issued over 400,000 Eucalyptus, some Cypress and miscellaneous fruit

tree seedlings. In North Kavirondo existing nurseries were maintained. In Central Kavirondo, where tree planting to save the burning of manure is so necessary the local native council is averse to spending money on this service and considers that this work should be left to private enterprise and the nurseries were not replanted during the year. A fruit tree nursery has, however, been started at Maseno.

In Kericho three block plantings of Cypress were done. A number of Cypress were also planted by individuals in all parts of the district.

QUANTITIES OF PRODUCE MARKETED IN 1946 AND 1947 WITH VALUE TO PRODUCER

COMMODITY	QUANTITY		VALUE TO PRODUCER	
	1946	1947	1946	1947
			£	£
Seed Cotton ..	6,062,156 lb.	5,335,472 lb.	49,170	48,239
Maize	682,068 bags	672,044 bags	292,623	317,038
Beans ..	3,478 ,,	75 ,,	5,430	77
Cowpeas ..		6,471 ,,		12,942
Green Gram ..	1,251 ,,	2,955 ,,	2,188	5,910
Potatoes	4,500 ,,	688 ,,	1,740	366
Simsim	752 ,,	903 ,,	762	975
Groundnuts ..	13,292 ,,	19,458 ,,	14,355	25,464
Rice Paddy ..	14,289 ,,	4,647 ,,	9,645	4,109
Mtama	29,645 ,,	9,822 ,,	12,228	4,052
Wimbi	44,062 ,,	30,417 ,,	34,930	24,445
Wheat	2,946 ,,	2,218 ,,	2,946	3,093
Coffee (Cherry) ..	206,463 lb.	214,687 lb.	1,600	3,701
Firewood (estimate)	—	—	10,000	12,000
Vegetables (,,)	—	—	8,500	8,500
Ghee	34,548 tins	30,177 tins	43,650	36,248
Dried Cassava ..	37,404 bags	24,948 bags	9,351	6,237
Eggs	5,060,952 eggs	3,657,948 eggs	19,231	13,829
Poultry	—	26,363 birds	—	2,815
		TOTAL ..	518,349	530,040

Note.—In addition to the coffee cherry 4,547 lb. of Buni were delivered to Kisii pulping stations.

It should be remembered that the figures, as above, denote surpluses after feeding a population of up to two million.

CROP IMPROVEMENT

Again there has been little opportunity for plant trials, but routine mass selection work has continued and the selections from local sorghum and wimbi varieties at Kisii. The following seed issues were made during the year:—

Beans, Lima	53 bags
Beans, mixed	70 ,,
Beans, Soya	120 ,,
Edible Canna	25 ,,
Field Peas	53 lb.
Groundnuts	85 bags
Maize	18 ,,
Mtama	3 ,,
Rice	29 ,,
Sweet Potato Vines	30 ,,
Wattle	7 ,,
Wimbi	4 ,,

A considerable quantity of vegetable seed, including £50 worth in South Kavirondo and five pounds in Kericho, were purchased and resold to African growers.

Progress of Mixed Farming

Propaganda for mixed farming and alternate husbandry has continued, but little progress has been made. Night paddocking is being stressed in Kericho.

Implements

Light single furrow ploughs have been in free supply, but fork jembies, wheelbarrows, carts, or axles to permit their construction locally, have been practically unobtainable and are urgently needed in quantity; the barrows and carts particularly for moving manure.

Soil Conservation and Fertility

With the exception of Kericho, where it has been maintained, progress has been slow, with some quickening later in the year as a result in North Kavirondo of concerted propaganda and in the Luo areas of the revival of the one-day-a-week community effort. The appreciation of the need for soil conservation work is certainly more widespread and has been encouraged by visits to other districts notably Machakos. Much of this is, however, still in the form of lip service. With the unavoidable stress during recent years on production and marketing much of the earlier work has been lost. A drive to improve the technique of our field staff has been necessary, and without adequate reports it is impossible to give statistics on the work accomplished.

North Kavirondo.—Lack of co-operation between chiefs, headmen and Indigenous Land Authorities (Liguru) was overcome by an intensive drive by all administrative officers, and the rate of progress has improved. A fair amount of terracing was done, notably in the southern locations. Reclamation of cattle tracks and very bad areas has continued and some 930 acres were closed to grazing and cultivation. In Maragoli the top of one of the rocky hills was set aside for tree planting and demarcated with a stone bank. The density of population in the southern locations makes real conservation planning and land usage impossible. In the Kitosh area little actual conservation work has been done. The stress has been mainly on manuring and grass leys, and with the re-posting of an officer to Kimilili in December it is hoped that progress will be made.

Central Kavirondo.—In general little of a lasting nature has been done, but some progress has been made with closure and reclamation work with the revival of "Thursday Work", one-day-a-week community work. Ploughing is now more generally on the contour. Trash lines have proved ineffective as they are lifted for fuel, and it is estimated that 90 per cent of the manure is also used as fuel.

South Kavirondo.—A steady improvement in the numbers and size of trash lines was maintained in the Kisii locations and they are now noticeable when the land reverts to grass. This and the tendency to keep land under cultivation for longer periods necessitates putting them on the true contour.

At the end of the year community work was revived on a considerable scale in Karachuonyo and some good work was done. Subsequent damage by stock was difficult to control. Some 130 acres were manured at about 15 tons to the acre under an Agricultural Betterment Fund subsidy scheme and the service is proving popular.

Kericho.—With enthusiastic team spirit and room to move very good progress has been made with soil conservation work in Kericho. A considerable number of holdings were terraced by their owners in Belgut, Sotik and Buret, but generally the contour grass strip is preferred. Eighty to ninety per cent of holdings have these strips, though they are not always on the true contour and many are far too narrow. Constant effort is made to have them improved.

Cultivation on very steep slopes and within fifty yards of streams is forbidden. Many cattle tracks have been closed and terraced to prevent gullying. Advice to allow land to revert to grass after three years cultivation met with some response, but no progress can be reported in the carting of manure and very little in night paddocking. Location Agricultural Committees particularly those of Belgut and Buret have done excellent work and although monoculture of maize and excessive areas under the plough give cause for alarm the tribe in general appears to be becoming soil-minded.

Dams and Water Supplies

With changes of staff and pressure of other work little progress has been made in the construction of dams, and water holes. Two dams in Central Kavirondo were completed in the second half of the year. Greater activity in increasing numbers and capacity is envisaged for 1948.

Famine Relief and Prevention

Some local food shortages occurred towards the end of the year but were met by internal movement without government assistance. In addition to the planting of root crops, the early planting of all crops has been stressed, particularly in South Kavirondo. This is essential in the drier areas to take full advantage of the rain and in the wetter, heavy-soil areas to give the plants a good start before waterlogging occurs. Extension of rice growing, which was continually stressed, will also give an added insurance against food shortages.

Produce Inspection

With a few minor and soon remedied weaknesses Produce Inspection Services have functioned satisfactorily. No grading was done and Nyanza continued to draw a flat rate bonus—K.2 to K.8—for maize. Quality was maintained and was certainly far superior to that of maize supplied by the Indian farmers and the European farmers of Sotik.

A summary of bags of produce inspected during 1947 is given in Appendix A and of produce prices in Appendix B.

Marketing

The marketing system has functioned satisfactorily during the year, but with changes of Marketing Officers, considerable guidance by Agricultural Officers has been necessary. This is, however, decreasing and Agricultural Officers are now able to spend more time on their proper duties. Three new markets were opened in South Kavirondo and seven in Kericho.

In many areas the numbers of traders licensed to buy produce is considered excessive, but little can apparently be done about the numbers of existing licensees, although the amounts handled are small; in Central Kavirondo an average of 245 bags of maize or mtama per licence per annum. Adequacy of produce is, however, considered in connexion with new applications.

Storage facilities are in many cases deplorable and adequate stores will in future be insisted upon before licences are renewed. In North Kavirondo millers have caused considerable trouble by building up on their exchange business stocks of very inferior produce.

In South Kavirondo there was considerable congestion at Kendu Bay early in the year but with a new pier and store conditions improved later.

Close liaison between Agricultural and Marketing Officers and the office of the Deputy Maize and Produce Controller has continued and the excellent system of organized marketing of produce has been maintained. Prices to the grower for controlled produce are fixed at a flat rate covering all markets in each district. In this way spread of cultivation is attained and the grower knows exactly what he is going to get for his surpluses. Unfortunately advice on increases of prices have not been announced sufficiently early to obtain the increases in production

required. In the case of maize a deduction is made from the price of each bag and the proceeds together with the grade bonus and savings on the transport pool are credited to the district Agricultural Betterment Funds. Savings on transport of other controlled produce are held for the credit of these funds. The price of maize was increased to Sh. 20 per 200 lb. f.o.r. on 4th November, 1947, and the following is the price structure adopted for this crop.

	Maize Price Structure N.K. and C.K.	1947–1948 Plantings S.K. and Kericho
	Sh.	*Sh.*
Cost of 200 lb. net Maize at Growers' Market	11·55	10·85
Primary Traders' Commission at 4 per cent, say	·45	·45
Bag Removed from Price Structure as no longer Purchased by Trader	—	—
Cost at Market	12·00	11·30
Handling and Inspection Fee	·10	·10
	12·10	11·40
Nyanza Traders' Commission 1947-48 at 2 per cent based on Total Cost at this Stage plus Nyanza Overall Average Cost of Transport of Sh. 1/60 per Bag of 200 lb., say 30 cents ..	·30	·30
	12·40	11·70
District Actual Cost of Average Transport ..	1·40	2·20
Nyanza f.o.r.	13·80	13·90
K.2-K.7 Grade Bonus	2·00	2·00
Control	15·80	15·90
Storage	·80	·80
	16·60	16·70
Betterment Fund	3·40	3·30
f.o.r. Value without Bag	20·00	20·00

Agricultural Betterment Fund

For the 1946–47 maize crop the following credits accrued to the district Agricultural Betterment Funds:—

	£
Saving in transport	13,302
Grade bonus	13,455
Betterment Fund	115,026
Total ..	£141,783

Credits due to these funds from savings on transport on other controlled produce for the years 1946 and 1947 are as follows:—

	Sh.	*cts.*
Wimbi	25,994	00
Mtama	10,568	94
Cassava	9,450	44
Groundnuts	13,990	03
Simsim	303	17
Peas	a loss of Sh. 31/27	

At the end of the year the funds accumulated in District Agricultural Betterment Funds stood as follows:—

	£	s.	cts.
North Kavirondo	133,276	0	0
Central Kavirondo	16,855	19	42
South Kavirondo	36.796	19	89
Kericho	32,260	5	89
Total ..	£219,189	5	20

Some of these funds have been utilized for the payment of betterment staff, improvement of water supplies and manurial services and publicity has been given to the means of qualifying for the full price by adopting proper farming practices. None have qualified yet and the allowance of part of the difference for progress is now advocated. It is difficult though to see how this can be done on any scale, except through group farming and marketing.

African Agricultural Training at Bukura

Agricultural Training.—Senior Students: 25.

Junior Students: 36, of whom two were dismissed as useless. Five were ex-askari taking a one-year course.

Teachers: 5 for one year's agricultural training to fit them for agricultural teaching in schools.

Even of the junior students only three were post-primary and the general standard of education is far too low. In 1948 Primary Standard will be insisted upon.

The teaching of soil conservation technique has been brought into line with that used in Central Province and this change was appreciated by the pupils, who find these methods much easier to assimilate and quicker to perform.

Three refresher courses concentrating mainly on soil conservation were given for Instructors in May, June and November. The last course was for the better Senior Instructors and the Senior Agricultural Officer gave lectures and attended a meeting at which various problems were discussed. There is no doubt that this course and the discussions thereat did a great deal to improve morale and team spirit. The teachers in training also attended these lectures and discussions and took a very intelligent part in the latter.

Development.

(*a*) *Buildings.*—On the group farm one three-unit rondavel was completed and a second practically completed, brick walls and thatch roof. A co-operative store with brick pillars, thatch roof and withy walls was also completed.

The old school room has been re-roofed with thatch and the walls repointed with cement. It will be used by the Fertilizer Team Officer until his house is built and then as a welfare hall.

(*b*) *Instructional Farms.*—Sixteen individual holdings varying from 1½ to 12 acres in size and the group farm of fifty acres have been maintained. It is obvious that these farms are now overstocked and have been rather overcropped in recent years to produce sufficient food for the staff and students, and that the production of fodder crops has been inadequate. Bukura has recently been supporting some 100 people and 150 head of cattle on about 100 acres of cultivated land and leys, with some 50 acres of very poor permanent pasture, and all this on land much of which is inherently poor and thin. The stock themselves are very poor and without reasonably productive animals, economics will militate against our propaganda for mixed farming and alternate husbandry. Liverfluke infestation is severe due to

the poor swampy watering places and an adequate water supply, provision for which has been requested annually without result, is the first essential, followed by a dip, fencing, and better stock, if Bukura is to develop and serve a real purpose in agricultural demonstration and training, whether this be for departmental staff, or, as is hoped after the new training centre at Maseno opens, for adult farmers.

Social Welfare.

The Local Native Council Spinning and Weaving Centre continued to function, but it was found that many of the pupils had been attending for two years and were in fact using the facilities for their own gain. This was stopped and for the last four or five months only four pupils attended.

The troop of scouts has been maintained and membership increased. Unfortunately they were unable to attend the annual camp at Yala.

Sport.—Owing to pressure of work it was not possible for students to enter for the district sports and football was handicapped by lack of transport for away matches.

Pests and Diseases

Locusts.—Nil.

Pests and diseases of cereals.—Pink ear rot of maize was reported in the Central and Southern locations of North Kavirondo, but in Kericho the incidence was less than in recent years.

Stalk borer was reported for the first time in maize in West Sotik. It was fairly severe in the north-west of North Kavirondo, negligible elsewhere.

Striga infestation was severe as usual on sorghum in the Luo areas.

Army worm.—None reported.

Head smut was fairly severe on ratooned sorghum in some areas.

Pests and diseases of coffee.—Hemeleia was widespread and coffee berry disease caused considerable loss of crop in Kisii, but *Antestia* was very much reduced by persistent baiting with sugar and sodium arsenite.

Pests and diseases of cotton.—Lygus and *Helopeltis* and *B. malvacearum* did considerable damage to the cotton crop, as did *jassid* on a few holdings in the lakeshore area. Stainers were numerous at the end of the 1946–47 crop, but very few could be found on the 1947–48 crop.

Potato diseases.—There was little wilt in the Kericho reserve, but it was severe on some Sotik farms and together with blight (*Phytophthora*) almost wiped out the main crop in Kisii.

Rosette disease of groundnuts.—Very little reported.

Datura Stramonium is still very widespread and a continued drive will be necessary.

Rosalinea root rot caused some damage to tea on certain Kericho estates. It appears that the shade tree *Grevillea robusta* is very susceptible to this disease.

Woodiness disease continues to cause losses on passion fruit in Sotik.

Crop Investigational Work

General.—Grass observation plots have been maintained at all stations and some extension and subsidiary plots have been planted in the reserves.

Rice trials at Bukura were temporarily suspended in view of the heavy incidence of blast. Selection work continued on Kitale Flat White and Katumbili maize at Kisii, where 46 varieties of sorghum, 45 of wimbi and 12 of sweet potatoes were grown on pending statistical trials.

Hybrid maize varieties failed at Kericho and showed no great promise at Maseno. They were, however, planted very late. A variety of sweet potatoes that sets tubers under Kericho conditions has been found and is being bulked.

Phosphatic trials.—The ten-year phosphate trials continued at Kakamega, Bukura, Maseno and Kisii.

At Kakamega, Uganda rock phosphate at 200 lb. per acre again produced the greatest yield of maize, but the controls gave the most even collection of cobs, with few nubbins and little deformation. The totals of six replicates were as follows: the plots are one-fortieth of an acre in size, but the maize was grown on half of each plot only. No figures are available for the sorghum on the other halves due to an error in harvesting.

Treatment	*Control*	*S100*	*S200*	*U.R.200*	*U.R.400*
Total damaged cobs	264	309	269	390	310
Per cent damaged due to "tipping" ..	33%	38%	37%	36%	35%
Weights were as follows:—					
Total weight of cobs (in lb.)	642	634	601	758	652
Weight of clean grain	383	362	366.5	435.5	357
Weight of damaged grain	11.25	16.75	11.5	22.5	13
Total weight of grain	394.25	378.75	378	458	370
Per cent grain in cob	61.4%	59.7%	62.8%	60.4%	56.7%

Yields at Bukura and Maseno were not good, and at Kericho a short term observational trial with silicophosphate on maize produced no results as the crop was stolen by African township inhabitants.

At Kisii the following average yields (6 replicates) have been obtained:—

(Dressings at the same rates as at Kakamega.)

1946 Maize (in lb.)	90.83	104.33	85	92.75	78.17
1947 Wheat (in oz.)	147.33	237	137.67	179.33	197
1947 Soya Beans (in oz.)	32.83	50.17	30.17	37.36	31.33

Yields for 1946 were from plots of one-fortieth of an acre and for 1947 for half plots of one-eightieth of an acre. It will be seen that silicophosphate at 200 lb. per acre has given the best yield in each year.

With the assistance of East African High Commission Fertilizer Team it is hoped to conduct more complete fertilizer trials over as wide a range of conditions as possible in North and Central Kavirondo in 1948. The co-operation of African farmers was sought and a number of sites were selected during the year.

Departmental Farms

Departmental farms were maintained at Kakamega, Maseno, Kisii and Kericho in addition to Bukura.

At Kakamega after a bad start maize came away well and gave a yield of 16 bags to the acre. Wimbi at 1½ bags and sorghum at 2½ bags to the acre yielded badly, and bean crops were a failure giving little more than the seed.

At Maseno yields were very poor; maize damaged by hail after poor germination 1½ bags, sorghum 1½ bags, wimbi 2.7 bags and soya beans 3 bags to the acre. Due to the failure of the short rains no crops were planted.

Kisii farm gave fair crops. That part of the farm that was deliberately cropped continuously for six years has shown conclusively that while crops can be grown there for this length of time with the aid of manure, it is only at the expense of the structure of the soil, which has deteriorated to a very marked extent. This land will be put down to grass to recover and will then be brought into the alternate husbandry system of the rest of the farm.

At Kericho it is reported that the grazing after natural reversion to Kikuyu and star grass after cultivation is so good that 27 head of cattle grazed on four acres from January to November, when the abnormally dry weather started. The four acres were divided into three paddocks and grazed rotationally.

As mentioned for Bukura a much better type of milk cow is required for our farms. At Kisii the farm is fenced and watered and believed to be clean; the Veterinary Department dip adjoining is used. Here it is felt that rapid strides could be made. Elsewhere fencing, water supplies, and dips are urgently required.

The possibility of obtaining land in the Kakamega Forest for a provincial experiment farm and for a "First Offenders Prison and Farm" to be run in close co-operation with it has been mooted and is meeting with support and sympathetic consideration.

Conclusion

The past year has been a bad one climatically and the results will be felt in the first half of 1948, when some food shortage is inevitable.

Monoculture of maize continues with falling yields and larger acreages encouraged by the new increase in price. Appreciation of the aims of conservation is increasing, but the will to work and appreciation of the urgency of the problem is still lacking. There is urgent need for the team spirit of provincial and district headquarters to spread to the division, the location and the sub-location and for the emergence of an acceptable Land Authority indigenous, developed or possibly a combination of the two.

P. C. CHAMBERS,
Senior Agricultural Officer.

APPENDIX "A"

PRODUCE INSPECTED—1947

	N.K.	C.K.	S.K.	Kericho	K.L.	Total
	Bags	*Bags*	*Bags*	*Bags*	*Bags*	*Bags*
Maize	339,751	43,041	110,913	265,390	—	759,095
Mtama	1,579	1,679	4,233	—	—	7,491
Simsim	761	—	45	—	—	806
Groundnuts ..	—	646	18,672	—	—	19,318
Beans	—	—	112	43	—	155
Wimbi	1,451	330	21,694	790	—	24,265
Choroko	816	380	1,750	—	—	2,946
Rice Paddy ..	3,622	675	—	—	—	4,297
Potatoes	—	—	261	430	—	691
Wheat	—	—	1,339	879	—	2,218
Cowpeas/Kunde ..	—	—	6,391	—	—	6,391
Cassava	13,247	10,975	—	—	—	24,222

NOTE.—These figures do not tally with those for purchases by Control and include a certain amount of re-inspection.

APPENDIX "B"

PRODUCE PRICES, 1947

	EXPORT f.o.r.				TO PRODUCER		
	UNIT	A	B		UNIT	A	B
		Sh. cts.	*Sh. cts.*			*Sh. cts.*	*Sh. cts.*
Maize ..	200 lbs. N.K. & C.K.	17 50	20 00		200 lbs.	9 45	11 55
	S.K. & Kericho	17 50	20 00			8 75	10 85
Beans ..	200 lbs. N.K. C.K. & S.K.	26 50	29 55		200 lbs.	20 00	21 00
Cassava ..	125 lbs. N.K. C.K. & S.K.	13 50	13 50		125 lbs.	5 00	5 00
Eggs ..	Prices were varied to control deliveries according to supply and demand as follows:—				Grade 1 12-15 cents each Grade 2 10-13 „ „ Grade 3 6-11 „ „ Grade 4 4- 6 „ „		
Groundnuts	180 lbs. N.K. C.K. & S.K.	27 00	35 70		180 lbs.	21 60	27 00
Potatoes ..	180 lbs. S.K. & Kericho						
	January-March ..		13 00		180 lbs.	10 50	
	April-June ..		14 50			12 00	
	July-August ..		10 00			7 50	
	December		13 00			10 50	
Rice ..	Ton .. C.K.	241 07	316 14		1 lb.	08	12
	N.K.	234 64	309 71				
Simsim ..	180 lbs. C.K. N.K. & S.K.	27 00	36 20		180 lbs.	21 60	27 00
Mtama ..	200 lbs. C.K. N.K. & S.K.	13 60	15 60		200 lbs.	8 25	9 00
Wimbi ..	200 lbs. C.K. & N.K.	21 95	26 45		200 lbs.	14 00	17 50
	S.K. & Kericho	21 95	26 45		200 lbs.	16 00	17 50

NOTE.—Column A for period 1st January, 1947, to 2nd November, 1947.
Column B for period 3rd November, 1947, to 31st December, 1947.

APPENDIX C

Value of Controlled Produce to Grower and Export f.o.r., 1947

	To Grower	*Export f.o.r.*
	£	£
Maize	317,038	599,378
Beans	77	108
Cassava	6,237	10,524
Eggs	13,829	16,564
Groundnuts	25,464	33,437
Potatoes	366	452
Rice	4,109	5,037
Simsim	975	1,219
Mtama	4,052	6,680
Wimbi	24,445	35,055
Totals ..	£396,592	£708,454

Note.—Cowpeas and green gram were not controlled until towards the end of the year and averaged Sh. 40 per 200 lb.

ANNUAL REPORT OF THE SENIOR AGRICULTURAL OFFICER, CENTRAL PROVINCE, 1947

Staff

European

The following officers were in charge of the Province and districts during the year:—

Central Province.—Mr. L. Lyne Watt, Senior Agricultural Officer from 1-1-47 to 31-5-47; Mr. J. T. Moon, Senior Agricultural Officer from 1-6-47 to 31-12-47; Mr. W. J. A. Hubbard, European Clerk from 1-11-47 to 31-12-47.

Meru District.—Mr. J. P. Benson, Assistant Agricultural Officer the whole year; Mr. T. R. Golding, Assistant Soil Conservation Officer from 10-12-47 to 31-12-47.

Embu District.—Mr. G. B. Rattray, Agricultural Officer from 1-1-47 to 31-1-47; Mr. L. H. Brown, Agricultural Officer from 1-2-47 to 31-12-47; Mr. J. E. Cotton, Assistant Soil Conservation Officer 27-8-47 to 31-12-47.

South Nyeri District.—Mr. S. V. Subba Rau, Agricultural Assistant from 1-1-47 to 28-2-47; Mr. G. B. Rattray, Agricultural Officer from 1-3-47 to 6-8-47; Mr. S. D. Goodwin, Assistant Agricultural Officer from 7-8-47 to 31-12-47; Mr. S. M. Jordan, Assistant Soil Conservation Officer from 1-3-47 to 31-12-47.

Fort Hall District.—Mr. T. Hughes Rice, Assistant Agricultural Officer from 1-1-47 to 31-3-47; Mr. C. D. Knight, Senior Assistant Agricultural Officer from 31-3-47 to 31-12-47; Mr. R. Benham, Assistant Soil Conservation Officer from March, 1947, to September, 1947; Mr. G. C. H. Hill, Assistant Soil Conservation Officer from September, 1947, to 31-12-47.

Kiambu District.—Mr. G. J. Gollop, Senior Assistant Agricultural Officer the whole year; Mr. I. G. Brown, Assistant Soil Conservation Officer the whole year; Mr. Milne, Marketing Officer to 31-12-47.

Machakos District.—Mr. G. S. Cowley, Agricultural Officer the whole year; Mr. G. Beverly, Assistant Soil Conservation Officer 1-1-47 to 4-11-47; Mr. J. S. Bagenal, Assistant Soil Conservation Officer 15-7-47 to 31-12-47; Mr. F. Trubridge, Assistant Soil Conservation Officer 20-12-47 to 31-12-47; Mr. G. J. Javens, Assistant Agricultural Officer 28-12-47 to 31-12-47.

Kitui District.—Mr. L. C. Edwards, Assistant Agricultural Officer the whole year.

African

Government—

Makerere Assistants	1
Clerks	9
Agricultural Instructors	185
Produce Inspectors	4
Apprentices	24
Labourers	72
Soil Conservation Staff	9
Locust Scouts	6
River Scouts	9
Sundry Employees	4
	323

L.N.C.—	
Agricultural Instructors	2
Assistant Agricultural Instructors	345
Labourers	342
Produce Inspectors	61
Vermin Poisoners	21
Sundry Employees	149
	920
D.A.R.A.—	
Clerk	1
Agricultural Instructors	4
Assistant Agricultural Instructors	87
Labour (Soil Conservation)	103
Apprentices	1
Levellers	117
Grazing Guards	4
	317
Grand Total	1,560

Travelling

The officers, European and Asian, spent altogether 675 nights on safari and travelled 53,407 miles by car.

General Seasonal Conditions as Affecting Crops and Stock

Food Crops—General.—It has been many years since Central Province enjoyed such excellent long rains, though very naturally over such a wide area there were considerable variations. The year commenced well in all districts as not only were the 1946 short rains generally very satisfactory but rainfall continued into January, 1947, and thus ensured very good yields from crops planted in the previous October and November. Famine relief, which had been necessary in Machakos and Kitui, ceased entirely in March, 1947, and was not again necessary during the year.

February was normally dry but at the end of the first week of March very general rain fell in sufficient quantity to permit the planting of long-rain crops, where land was ready. Conditions remained very satisfactory for plant growth and a dry spell in the first half of April permitted weeding operations to be carried out at the optimum time. At the end of the third week of April the rains returned in earnest and over large areas of the Province falls were recorded on practically every day for four to five weeks. Rainfall in the higher areas was excessive for plant growth but in the lower areas where droughting is normally common, crops benefited. The rains eased off in June but Kiambu, Fort Hall and Embu districts continued to register considerable rainfall. The "Gathano" mist season was somewhat late in arriving but set in towards the end of July and continued throughout August and the early part of September. Mist was particularly prevalent in Kiambu and Fort Hall districts.

There was little sign of the short rains at the time they were due but they arrived early in November and continued into December on a diminished scale. Meru was the only district which had really satisfactory short rains, the rainfall for November in that district being 16.79 in. in 24 days, the highest for 20 years. In all districts the lack of finishing rains during January, 1948, reduced yields of short rains crops.

Long rains harvests of food crops were generally very satisfactory with the exception of potatoes and beans. Yields of short rains crops were on the whole light and in some places maize was a failure.

Cash Crops.—Although sales of wattle products still occupy a very important place the return of better climatic conditions has resulted in very considerable revenue from the sale of maize and legumes, the cash return from the latter being the largest single item listed. Potatoes, bananas, hides and skins, poultry and eggs were all major products for sale from the Province.

Maize.—The fact that during 1947, 180,936 bags of maize were sold to the Control compared with 993 bags in 1946, speaks for itself. A considerable surplus for sale was produced from the 1946 short rains crop and the internal price of maize rapidly fell to that approximating to the Control purchasing price. Considerable sales to the Control commenced during February and continued for the remainder of the year. Fort Hall and Embu districts produced the largest surplus but Meru and South Nyeri were also in the market. Even in Machakos District a surplus was produced from the Kangundo/Matungulu area and arrangements were made to purchase this for retention in the district.

It should be stressed that the sale of maize forms no part of the agricultural policy for Central Province but with the present high prices growers will tend to produce this crop for sale, regardless of declining fertility.

Wattle.—The total tonnage of wattle bark sold was 25,915 tons. During the first season unusually heavy rain in January interfered with marketing. The onset of the long rains early in March also combined to make the season a very difficult one and large quantities of stacked bark were caught by the rain. It was necessary to extend the season into April to clear existing stocks which had accumulated owing to shortage of bogies on the railway.

In the second season also weather was difficult, particularly in Fort Hall. Although there are continually complaints from the wattle companies that immature wattle bark is sold, nothing is done by the buying agents to prevent this taking place and the Agricultural Department Inspectorate is made the scape-goat.

During the year a system of wattle-stripping permits was introduced. Various teething troubles were experienced and the position was not made easier by the very high price which induced growers to resort to anything to sell their bark. It is anticipated that the issue of stripping permits will be much more effective in 1948 in preventing the sale of immature bark.

Legumes.—Sales of beans show no proportionate increase. This was partly caused by the bad effect of too much rain in the first season and partly because the price of other pulse crops was far more attractive. Sales of the other pulses, pigeon pea, dolichos, cowpeas, green and black gram and Bengal gram were very considerable. Meru and Embu districts were the main suppliers but Kitui also contributed 15,000 bags. Although the heavy long rains adversely affected yields of some pulses, notably njahi, the fact that the Province was free of famine induced heavy sales.

The value of the higher-priced legumes in the areas more remote from railhead is very obvious and agriculturally also they are most useful for rotational purposes.

Potatoes.—A total of 52,188 bags of potatoes was sold, the biggest quantity being from Kiambu District. Sales were on a considerable scale during the first few months of the year and would have been heavier had not the Control closed down on buying in Meru at the height of the season. "Blight" was serious during the long rains and also affected short rains plantings. Only very small quantities were offered for sale through legitimate channels in the second half of the year. The new variety, 914, shows promise of being blight resistant and small issues of seed have been made.

Tobacco.—

Flue Cured.—

District	Short Rains Green Leaf			Long Rains Green Leaf		
	Acres	Pounds	Paid to Growers	Acres	Pounds	Paid to Growers
			Sh.			*Sh.*
Embu	67	160,916	7,989·86	33·4	25,715	1,206·03
Fort Hall ..	45	224,000	10,528·00	40	51,388	2,569·40
Kitui	70	261,674	17,978·80	80	361,648	18,510·95
Total ..	182	746,590	36,496·74	153·4	438,751	22,286·48

The Kitui short rains crop was short of the quota by ten acres as some growers were absent at planting time in search of food. The crop was a heavy one though not a record for the district. The Embu and Fort Hall crops were also above average. An experiment with irrigation at Kutus' suffered severely from White Mould but in the short rains, 1947, an excellent irrigated crop was produced.

The long rains crops suffered from too much rain and what would have been a record yield for Kitui was spoilt somewhat by White Mould. Embu and Fort Hall lost six and seven acres respectively from flooding and much of the remainder was waterlogged.

Tobacco is becoming increasingly popular, particularly in Kitui, where there is a long waiting list of applicants. Extension in that district is limited by the number of nursery sites with permanent water.

Native.—The sale of native cured tobacco from Mwimbi forms an important item of revenue for Meru District. Recorded sales for the Province amounted to £6,465 but as a great deal of the crop is hawked about the country by the growers and is difficult to trace, the total actual income is probably much greater.

Coffee (Arabica)—

Area	Total Acres	Total Growers	Sales
Embu:—			*Sh.*
Githungururu ..	22·50	86	
Ngandori	15·50	64	
Kyeni	5·50	28	4,093·38
Kagaari	5·50	27	
Meru:—			
Chogoria	136·76	463	
Meru	43·70	131	31,224·01
Chuka	12·00	68	
Totals ..	241·46	867	35,317·39

Total value of crop: £1,765.

The number of growers increased very considerably from 474 in 1946 to 867 in 1947, the greater increase being in Meru District. The main 1946–47 crop from Chogoria, where 64 per cent of the total yield was classed II and III, was the best coffee yet produced in Meru. The two Co-operative Societies at Meru and Chogoria were registered in April. The new areas of Chuka, Muthambi and Nkubu are being financed by the L.N.C. and will not be taken over by Co-operative Societies until trees are in bearing. The existing factory at Chogoria is no longer capable of dealing with the crop and a new factory is nearing completion.

Altogether prospects in Meru are very bright and the Assistant Agricultural Officer writes: "Great enthusiasm is being shown for coffee; there are already many hundreds of prospective planters on the waiting lists, and the limitation is now that of the number of seedlings that can be produced, and to find sufficiently trained supervisory staff to maintain the high standard of culture which is so essential if coffee is to keep its place as a major crop".

Eleven acres of coffee were planted in the new areas of Kagaari and Kyeni in Embu District and the existing areas of Ngandori and Githungururu were increased by 4½ acres. Although the growers in the new areas have responded well to instructions, the general standard of cultivation and care of coffee in Embu District leaves much to be desired; nevertheless a very heavy crop was delivered to the Kapingazi factory towards the end of the year. Deliveries were at the rate of 6,000 lb. cherry per day and it was only by installing a small engine and adapting the hand pulper accordingly, that this quantity could be dealt with.

Revenue from both parchment coffee and mbuni was lower than in the previous year but this was largely derived from the 1946–47 crop. The 1947–48 crop was a very large one but this, of course, had not been sold by the end of the year.

Bananas.—With the removal of the ban on exports early in the year as a result of a much improved internal food position, large quantities of bananas commenced to leave South Nyeri, Fort Hall and Kiambu districts. The number of bunches imported into Nairobi is phenomenal and practically every native bus carries its quota. It is estimated that revenue to the amount of £25,723 was derived from the sale of bananas as compared with £2,844 in 1946.

Vegetables, Fruit and Flowers.—Revenue from this source is estimated at approximately the same as in the previous year. Kiambu continues to profit from its proximity to Nairobi and this district receives some 35 per cent of its visible revenue from the sale of vegetables and flowers.

Fort Hall plum growers arranged to deliver some of their crop to the Mua Hills factory. The quantity of mangoes exported from Kitui, mostly in the green state, was 103 tons, about half the quantity sold in the previous year. Machakos sold 813 cases of strawberries.

Onions are speedily becoming a major cash crop in Kiambu and it is estimated they brought some £5,000 to the growers. Meru and South Nyeri also sold a considerable quantity of onions.

Wheat.—Wheat growing in Meru, which had fallen off in 1946, remained at the same low level. Internal consumption accounts partly for the small sales but planting has also decreased. Growers find that maize at the present high price entails far less labour for the return received.

Small patches of wheat are grown in Embu, South Nyeri and Machakos districts but the grain is either consumed locally or more often finds its way onto the black market. An effort to increase wheat planting in the upper part of Fort Hall met with poor response.

Beeswax.—The year was a poor one for beeswax production in Kitui and in spite of a price of Sh. 2/50 per lb., exports were 8,000 lb. lower than in 1946. Only 177 frasilas were sold from Meru District, where, in spite of the high price, honey gatherers appear to be too lazy to collect and market the wax.

Pyrethrum.—Kiambu is the main producing area. African pyrethrum farmers there were somewhat disturbed during the year by a call to cease production voluntarily. The politicians naturally seized this opportunity and stated that it was an effort of the Pyrethrum Board to get rid of African production so that Europeans could grow more. Later it was decided that as the total African output was so small, it was not worth while curtailing their production.

There are still two African pyrethrum growers in Fort Hall. Proposals to extend the acreage elsewhere had to be abandoned temporarily until the position as to the market for this product in the future, was more clear.

Planting and Harvesting Times for Economic Crops

Crop		Planted	Harvested
Maize	L.R.	March-April	August-October
	Mist Zone	July-August	February-March
	S.R.	October-November	February-March
Beans	L.R.	March-April	June-July
	S.R.	October-November	January-February
Grams	L.R.	March-April	June-July
	S.R.	October-November	January-February
Dolichos		March-April	August-September
Pigeon Pea		October-November	August-September
Mtama	L.R.	March-April	January-February
	S.R.	October-November	July-August
Bulrush Millet		October-November	February-March
Foxtail Millet		August	January
Wheat		October-November	January-February
Potatoes	L.R.	March-April	June-July
	S.R.	October-November	February-March
Tobacco	L.R.	March-April	June-August
	S.R.	October-November	January-March
Coffee		March-April	October-December

Stock and Animal Products

Grazing, though seldom very plentiful, suffered less in 1947 from drought than it has done for many years. In spite of this signs of over-grazing were frequent. Whereas there is an increasing appreciation of the value of good grass few individuals do much to improve the natural grazing, largely on account of laziness and apathy. The few examples of correct grass management are heartening and one hopes that gradually the idea that grass is a crop will spread.

There was a drop in the quantity of hides marketed but the number of skins sold was approximately twice as much as in 1946 and the value nearly three times as great. A certain amount has been done to improve quality but little further will be achieved until new legislation is implemented. Indications are that most of the profit goes to the dealers and the producer gets little benefit for the careful preparation of his hides and skins.

The control of eggs and poultry in Central Province, never very effective, was removed during the year with no bad results. The demand for eggs fluctuated and with it the price. There was a 20 per cent increase in the number of eggs recorded as sold and a 50 per cent increase in the sale of cockerels, over 1946.

A reduction in the number and value of pigs sold to the Pig Finishing Station at Nyeri, from Nyeri and Fort Hall reserves took place. The keeping of larder pigs in the Kikuyu Reserves, however, appears to be on the increase as animal fat has a ready market internally.

With better grazing conditions exports of ghee from Kitui rose from 47 tins to nearly 2,000 tins in 1947.

Miscellaneous

Coriander.—Machakos exported 1,436 bags.

Tamarind.—Five tons only from Kitui.

Castor Seed.—Eighty-three tons from Kitui.

Miraa (Catha Edulis).—The Assistant Agricultural Officer, Meru, writes as follows: "Until the selling of miraa, a drug obtained from the young shoots of the Catha Edulis tree, was brought under control no one realized the amount of money that it was bringing into the district.

The sensational figures of Sh. 1,855,864 or £92,793 has been produced for the gross value of miraa sent out of the district under permit since April.

This then appears as the next highest revenue producer after legumes; the price obtained for it is in no way proportionate to the work involved in its production; it is an artificial price and is kept higher by the control of exports than it would be were free export allowed."

Crop Position and Improvement

There was again little opportunity for officers to spend much time on their farms in the selection of better types of the various crops grown. These farms have rather changed in character and it is no longer the practice to grow large quantities of seed for issue, frequently at the expense of fertility.

The very much better climatic conditions have generally improved seed supplies and if years of better rainfall may be expected there will not be the trouble of lost types, which was so prevalent during the years of food shortage.

There has been an increasing demand for grass seed (Rhodes) which is a very pleasant sign. Requests for fruit and other trees also are on the increase and in Kikuyu districts, at least, there are several African nurserymen who have set up for private gain and who incidentally are quite useful in furthering the planting of trees.

Seed issues were as follows:—

Cereals.

Bulrush Millet	5 bags
Wheat	5 „

Legumes.

Beans	2,005¼ bags
Field Peas	31 „
Potatoes	72¾ „

Grass Seed, etc.

Rhodes Grass	331 lb.
Lucerne	100 „

The following fruit and other trees were recorded as issued by the Department or from Local Native Councils' nurseries. The number was probably far greater.

Fruit Trees, Plants, etc.

Budded Citrus	11
Pawpaws	269
Grape Fruit	40
Oranges	77
Lemons	138
Sweet Oranges	33
Kei Apple (transplants)	12,900
Miscellaneous Fruit Trees	63
Trees, Exotic	174,753
Indigenous Trees	129,465
Hedge Plants	42,757

Progress in Mixed Farming

Progress is still lamentably slow and the number of really good holdings amount to a few dozen rather than hundreds. Admittedly a certain amount of capital is required to lay out a small mixed farm but this should present no particular difficulties to many individuals. Unfortunately money made in trading seldoms returns to the land from which it originated, for the development of agricultural holdings. Whereas a great number of cultivators simply have not the knowledge nor the ability to run mixed holdings, there are very many others with sufficient common sense to do so but who will not or cannot make the necessary effort. For these reasons the few examples of energy met with are acclaimed by Agricultural Officers as at least local successes, and these officers have done everything to foster and assist cultivators who appear determined to improve their land.

Kiambu District is far ahead of any other with mixed farming. While there is evidence of it scattered all through the district, in Chief Magugu's location the effort is concentrated. Although a large proportion of the manure used is bought, the realization of its value is causing many cultivators with stock to make a start with manure preparation on their holdings. This entails the keeping of more stock and therefore more grass. Rhodes grass is gaining in popularity and there are a number of good paddocks of this type. The Africans of Magugu's location appear to be thinking on the right lines and it is hoped that the construction of dips will enable them to keep more productive grade cattle. There will be a ready market in the reserve for any milk that they produce. The Local Native Council's manure scheme has been in full swing throughout the year and 4,000 tons have been supplied through it. It is estimated that a further 5,000 tons have been brought into the reserve by private enterprise.

In Chief Muhoya's location of South Nyeri further progress has been made but here many land holders would be well advised to cash in on the accumulated fertility in their grass paddocks and thereby adopt ley farming practice.

Fort Hall reports that more and more Africans are realizing the necessity of stock as an integral part of farm economy. The district has several good mixed farms and both fencing and manuring are on the increase. There is very wide scope in the upper parts of this district for mixed farms with particular emphasis on stock.

The Embu have not taken to manuring on any scale probably because there still is sufficient fertility to raise fair crops. The district, however, possesses one or two good individual efforts.

Over the greater portion of Machakos District lack of grazing, and therefore lack of stock and manure in the arable areas, militates against mixed farming at

present. The well favoured areas of Kangundo and Matungulu are an exception and considerable dressings of manure are appled to arable crops. At the Makueni Settlement a demonstration mixed holding has been laid out and is reported to have aroused some interest with the settlers moving in. The design of the holding is based on very much more intensive management of that type of land than has been considered hitherto. The results should provide most useful data for the settlement of Africans in that type of country.

Soil Erosion and Soil Fertility

	1946	*1947*
Miles terraced	13,131 miles	12,141.35 miles
Area terraced	39,429 acres	48,467.80 acres
Live wash stops (Meru only) ..	12 miles	No figure
Grassed drainage ways	6,121 „	5,578 miles
Area grass planted	4,688 acres	11,274 acres
Compost pits and *bomas* in use	28,389	22,920
Strip cropping	3,459 miles	No figure
Eroded land closed to grazing	83,294 acres	44,219 acres

Terracing.—Unfortunately the most important event to record was the complete break down of communal terracing in Fort Hall District during September following on a mass meeting of the Kenya African Union in July, at which it was decided that women should not be required to turn out for communal work. This decision, provided the very many idle young men took the place of the women, was reasonable but unfortunately the politicians of the district seized on the opportunity and not only did the women cease work but the numbers of men also dropped and terracing came to a complete standstill. Before the end of the year some recovery had been made. In certain areas communal work was re-commenced but in location 8, where previously the most astounding figures of terracing were recorded, the people utterly refused to accept the old method and terracing by individuals is now the rule there. It is regretted that the standard of individual work is far below that previously achieved, as supervision is made so much more difficult.

Had it not been for the trouble in Fort Hall it would have been possible to record another satisfactory increase in the number of miles terraced in Central Province during 1947, as most other districts recorded an increase over 1946. In this connexion it should be remembered that the total mileage of terraces made in Fort Hall during 1946 comprised more than 50 per cent of the total for the Province, whereas in 1947 it was under 30 per cent, the large proportion of the work having been achieved in the first half year.

Kiambu recorded a substantial increase in terracing during the year, though for the first three months it dropped to a lower level than for any period during the last three years. To encourage the competitive spirit a party of chiefs, Local Native Council members and elders were taken to Fort Hall, when work was at its height there. This and the engaging of additional levelling staff had the desired effect and immediate results were achieved. Repercussions from the trouble in Fort Hall were felt but opposition died down later. A reduction in work occurred in the last quarter when a large number of persons was engaged on picking the big Kiambu coffee crop.

In Embu the whole question of terracing has been re-organized. The main object now is to terrace all new land as it is opened and thus ensure that we at least keep up with the problem. Although the figure for miles completed is a slight reduction on the previous year's figures a very great deal of attention has been given to the maintenance of terraces constructed in the past. This was very necessary as the standard of maintenance in Embu District had reached a

deplorable state. It was estimated that the work done in this respect was equivalent to the construction of 4,000 miles of new terracing and that at the commencement of the 1947 short rains the vast majority of all old terraces were in good repair. This district should now be in a position to go straight ahead with terracing and greatly increased output should result.

In South Nyeri work has continued on the Muhiriga system and although progress has been made it has not been as rapid as was hoped for. However, this district, which has been so backward previously, shows some signs of gaining lost ground.

Progress in Meru District has been slow but a general improvement in the attitude adopted by the people towards soil conservation is reported. All terracing is done communally but as in previous years great difficulty was experienced in achieving a large mileage as crops were on the land most of the year. There was, for instance, no free period between the harvesting of 1946–47 short rains crops and the planting of 1947 long rains crops. An intensive campaign was organized during July but very unfortunately political agitation reduced its effectiveness.

Machakos District achieved far better results with the terracing of land under the Utui system than previously. Whereas such work is highly necessary it is only one aspect of an enormous problem in that district and by itself will achieve little to improve the land.

Kitui reports an increase in output, it was about double that done in the previous year, but the work accomplished is very poor in relation to the available man-power. The district has been helped by the provision of a number of jembies and shovels for soil conservation work but it has become normal practice to blame shortage of tools for the small amount of work done and there is a tendency to expect Government to provide all tools necessary.

Grass Planting.—Conditions during much of the year were ideal for this operation and good progress is again reported from Kiambu, Fort Hall and Meru districts. Many areas which previously showed as red scars on the landscape have now been covered with grass and if correctly managed should be safe. In South Nyeri rather too much emphasis appears to have been placed on terracing targets with the result that badly eroded land which was terraced was not planted to grass before the rains ceased.

A very large number of grassed drainage ways were measured. In many cases these were not planted to grass. Levelling staff are really not sufficiently trained for setting out these drainage ways and frequently there is local objection to them if one particular "Githaka" owner suffers from reduction of his arable area.

Strip Cropping.—Although continued efforts have been made to get this across, particularly in Fort Hall, no real progress can be reported. In Fort Hall cultivators are toying with the possibility of using sweet potatoes alternated with strips of other arable crops. If this was acceptable it would be a step in the right direction.

No interest is taken in the Kapingazi strip cropping demonstration in Embu District and it appears that the large amount of money spent on it has been wasted. As other land was available to the occupiers they have moved elsewhere rather than be under our direction.

Paid Labour Gangs.—Three gangs were working in Fort Hall District throughout the year and two others for part of the year. These gangs are used on particularly badly eroded areas which are rather too complicated for attention by the Muhiriga and there is little doubt that they do excellent work. The gangs were employed in the Sabasaba, Mahindi, Fort Hall and Gaturi Hills areas, all places where very severe erosion has occurred in the past. Excellent weather conditions enabled grass planting of the areas dealt with to have the best results.

In Embu further work was done on the Gitige Hills which area had already received a great deal of attention in the past. Although the area has been extensively terraced the establishment of grass on the very infertile soil is proving difficult.

Tree Planting and Protection.—Meru continues to lead the field in the protection of trees. In Kikuyu districts there is a steady demand for tree seedlings but generally the exotic types are preferred although the better types of indigenous trees are also taken. In the more advanced districts the increasing demand for sawn timber is showing itself in plantations of trees planted for this purpose.

The figures of trees issued, shown in the paragraph "Crop Position and Improvement" are very far from complete as full records are not available at many nurseries.

Swamps.—The desire on the part of cultivators to open up swamps for crop production does not diminish and officers continually have to be watchful that illegal opening of swamps does not occur. Quite obviously eventually we shall have to develop these areas but not on the lines practised hitherto Very strict supervision and adequate funds will be needed for the purpose.

Dams and Water Supplies.—1947 saw a great improvement in general water supplies. The heavy rains caused many springs to flow again after a lapse of years and most of the dams made in the Province were filled early in the long rains.

In Kitui two new dams were constructed at Keuso and Mususu, respectively, before the short rains and both now contain water. Four bore holes were undertaken, two yielded satisfactory quantities of water, one only 80 gallons per hour at 500 ft. and the other has not yet struck water. None of these boreholes nor the two completed in 1946 have yet been provided with pumps.

A number of new dams were made in Machakos District and most contained satisfactory quantities of water at the end of the year. Very naturally this form of assistance is readily appreciated.

In Fort Hall various proposals to construct dams have always in the end been turned down as the result of the attentions of agitators.

Areas Closed to Grazing.—The closing of areas to grazing, where it is deemed necessary and essential, continues. In Machakos District the comments made in the Central Province Annual Report for 1946 still apply. Little improvement by mere closure alone is achieved. However, during the course of the year we have obtained a certain amount of additional information on the subject of establishing better grasses. This is referred to elsewhere in this report.

In other areas, however, where erosion has not reached the stage it has in Machakos, closure, plus a little minor cultural attention, has achieved excellent results. One such area is the Mwea of which the Agricultural Officer, Embu, writes:—

"When visited in February about 25,000 acres of the area was found in a very badly overgrazed state and closed forthwith. The area was again visited in May, when it was found possible to reopen three clearly defined areas totalling about ten thousand acres to controlled grazing. In December a further area of about 1,300 acres was opened, but this is the last that it will be possible to open for some time. The remainder of the area is still very badly eroded and it is impossible to say at this juncture how long it will take to repair it.

The method of reconditioning the badly eroded areas has been as follows. Plough scratches are made roughly on the contour and some feet apart. In these the seed of Teff is planted, and where available, the runners of *Cynodon.* The idea of planting Teff is to speed up the natural succession in such places by planting an annual grass which will hold the soil temporarily and give seeds of local perennial grasses a chance to grow. In the long rains the Teff planted

appeared almost certain to fail, but after the rains had ceased it came and gave a crop of seed. The locals were so pleased with it that they demanded more in the short rains. Some was planted and was doing well in December. Not only Teff but several species of local annual grasses appeared to be coming into the plough scratches when the area was visited in December and these local annuals are to be tried as well as Teff next long rains. The most satisfactory perennial grass to plant appears to be *Cynodon.*

The attitude of the people in the Mwea has been most satisfactory. They made no trouble when the area was closed in February, planted a certain amount of grass in rather a doubtful manner in the long rains and much more in the short rains, and now appear to be enthusiastic about grass planting. They have also not attempted to overstock the reopened grazing areas and have in fact not stocked them to the limits allowed. They have also divided each area (after some pressure) into blocks defined by natural boundaries which are being grazed for periods of three weeks at a time. There is, at present, no sign of overgazing in the areas that have been reopened."

Famine Prevention

Only during the first two months of the year was famine relief necessary in Machakos and Kitui districts, after which the Province not only fed itself but exported large quantities of foodstuffs.

There has been little internal demand for crops such as cassava as grain has been more plentiful. Stocks of cassava in the ground have therefore increased particularly in Meru, Machakos and the upper parts of Kitui. The lower parts of the last district still have inadequate sources of planting material. If seasons favourable for crop growth continue there will be a distinct danger of cassava being neglected and the acreage declining. This matter will be watched carefully and every effort is being made to ensure that the acreage is not only maintained but increased where necessary. Sweet potatoes, which are always popular, have been far more evident in the drier districts. In Kitui, for instance, the tubers have been plentiful in the native barter markets for the first time for some years.

In the intermediate and higher zones, yams, colocasia, sweet potatoes and bananas are the main famine prevention crops though cassava is also grown. Acreages have been maintained at a reasonably satisfactory level. The planting of yams is still restricted by a certain amount of fear of mealy bug attack.

Crop Investigational Work

A summary of the work done at the various stations is given below:—

Meru: Coffee Variety Trials—

	Mulched		*Unmulched*	
Variety	*Cherry*	*Buni*	*Cherry*	*Buni*
Harrar	138	54	96	35
Bourbon	45	20	34	35
Kenya Selected ..	142	49	91	29
Kents T.T.	439	139	385	138
Blue Mountain ..	252	121	227	75
Geisha	192	69	97	41
Kents Ceylon ..	355	125	247	92

This trial, which has been carried on for seven years has proved beyond doubt that Kents T.T., the variety chosen for general planting is the most suitable.

It has been the highest yielder both mulched and unmulched throughout the period, with the exception of 1946 when the change over to the new growth in the multiple stem system occurred.

The unmulched area is kept on more as demonstration to native growers than an experiment. The fact that it is shaded and the mulched plot is not renders the result useless experimentally.

Several obvious points have been noticeable between the mulched and unmulched plots.

(1) Throughout the drought years there was little reduction in yield from the mulched plots, but a very marked drop in those unmulched.

(2) Kents T.T. has shown itself to be more resistant to drought on the unmulched plots than any of the other varieties.

Silicophosphate Trials.—A series of experimental plots to test the value of silicophosphate on the infertile Chogoria bracken areas were put down in October. Treatments were: (1) Control—no treatment; (2) silicophosphate at 5 cwt. per acre; (3) silicophosphate at 5 cwt. per acre and lime at 4 tons per acre; (4) lime at 4 tons per acre. Result of this experiment which was planted to maize are not yet to hand. There was little difference that could be observed between the treatments at the end of December after two months' growth.

Kitui : Silicophosphate Trial.—No positive results were obtained using two rates of application of silicophosphate on Durum maize.

Embu : Burning Experiment—

Treatment.

Plot A.—Control. No burning or cutting.
Plot B.—Cut and cart.—January and August.
Plot C.—Burn January and August (two light burns).
Plot D.—Burn January only (one light burn).
Plot E.—Burn March and September (two fierce burns).
Plot F.—Burn March only (one fierce burn).
Plot G.—Burn August only (one light burn).
Plot H.—Burn August alternate years (light burn every two years).

Notes.—At present, Plots D, E, G and H look the best feeding. They contain a high percentage of red oat grass, but whether this is partly due to pre-treatment of the plots or not is not ascertainable.

The figures are not susceptible of accurate interpretation. Plots G and H, before buring, had the appearance of being under a dominant bush cover more so even than A, the control. Plots C, D, E and F have looked the best grazing through the year.

The worst treatment to apply appears to be to do nothing (Plot A).

Results.

Plot No.	Red Oat Grass Linear Feet	Other Grasses Mostly Couch	Total Grass	Total Bush	Per Cent. Grass	Per Cent. Red Oat Grass
A ..	20	1,011	1,031	1,012	50	1
B ..	123	951	1,074	829	57	6
C ..	314	839	1,153	673	63	17
D ..	504	825	1,329	408	76·5	29·6
E ..	479	895	1,374	494	73·5	26
F ..	353	785	1,138	895	56	17
G ..	897	353	1,250	780	61·5	44
H ..	1,244	199	1,443	414	77	67

South Nyeri.—A number of new potato varieties are under trial for blight resistance. Indications are that the 914 variety, though not a very good type of potato, is the most resistant to Irish blight.

Machakos.—A number of grass trials have been laid down in the district—at Machakos Seed Farm, Makueni and at centres typical of the "bad lands" with a view to discovering the best types of grass for the reconditioning of the reserve. Admittedly the growing conditions during the year were far better than for some time past but as the trials will be carried out over several years very useful information should be obtained. The following grasses are under observation:—

Seeded hay and grazing types—

Rhodes grass *Chloris Gayana.*

Cenchrus Ciliaris.

Seeded—

American love grass, *Eragrostis Curvula.*

Planted creeping types—

Star grass, *Cynodon Plectostachium.*

Digitaria Swazilandensis.

Woolly finger, *Digitaria Milanjana.*

Planted erect or bushy habit—

Panicum Makarikariensis.

Seeded hay and fodder types—

Sudan grass, *Sorghum Sudanense.*

Teff grass, *Eragrostis Abyssinica.*

Panicum Antidotale.

Other important indigenous species—

Eragrostis Superba.

Panicum Maximum.

Produce Inspection

After several years of drought and food shortage when produce inspection staff were largely engaged with the prevention of black-marketeering, it was only to be expected that they would tend to forget their true functions. When large quantities of maize and beans reappeared on the legal market early in 1947, the Inspectorate was not very satisfactory and officers had to tighten up very considerably in inspection. An improvement in the quality of produce leaving the Province subsequently took place.

The first wattle season in 1947 was made very difficult by heavy rain in January and March. Conditions at the inspection centres during March after the rains had broken became chaotic, and an extension of the season became necessary to clear stocks which had accumulated owing to lack of railway bogies. Quality was naturally adversely affected. Weather during the second season also was not ideal, particularly in Fort Hall and the drying of bark was a difficult operation. The sellers of bark, although quite aware of the standard required, continue to endeavour to off-load undergrade produce.

Marketing

The value of the sales estimated for the whole Province was approximately £1,039,514. Details are given in Appendix II.

Prices paid to the producers were as below:—

	f.o.r. at 31st December, 1947	Average Price to Producer During Year
	Sh. cts.	*Sh. cts.*
Maize	12 95 per 200 lb.	11 00 per 200 lb.
Boston Beans	23 00 „ „ „	21 00 „ „ „
Rose Coco Beans	18 00 „ „ „	16 00 „ „ „
Canadian Wonder Beans	17 00 „ „ „	15 00 „ „ „
Mixed Beans	14 00 „ „ „	12 00 „ „ „
Bengal Gram	50 00 „ „ „	47 00 „ „ „
Green Gram	42 00 „ „ „	70 00 „ „ „
Black Gram	50 00 „ „ „	70 00 „ „ „
Pigeon Pea	40 00 „ „ „	70 00 „ „ „
Cow Pea	35 00 „ „ „	70 00 „ „ „
Wheat	26 50 „ „ „	19 75 „ „ „
Potatoes	10 50 „ 180 „	8 00 „ 180 „
Field Peas	23 00 „ 200 „	21 00 „ 200 „
Mtama	10 25 „ „ „	10 00 „ „ „
Dolichos Bean	14 00 „ „ „	40 00 „ „ „
Bulrush Millet	18 00 „ „ „	16 00 „ „ „
Foxtail Millet	18 00 „ „ „	16 00 „ „ „
Ghee	—	40 00 „ frasila
Beeswax	—	2 50 „ lb.
Wattle Bark:—		
January-March	5 62 „ 100 lb. 126 00 „ ton	
August-October	6 72 „ 100 lb. 150 50 „ ton	142 00 „ ton
Hides (shade dried)	—	40 00 „ frasila
Skins	—	50 00 „ score

Until certain pulse crops were controlled at the end of the year there was a general upward trend in price levels. In the case of maize this was unfortunate and can only lead to further exploitation of fertility. Wattle bark prices soared and this fact has not been conducive to smooth marketing.

The Department is now rid of the work in connexion with the allocation of market plots and now associates itself only with the issue of produce licences.

Agricultural Education

Agricultural School, Embu.—Mr. Samuel Mbugua, African Agricultural Assistant, was in charge the whole year, with the assistance of a second teacher from July onwards. At the beginning of the year there were 22 apprentices, later joined by one from the Coast and another (of lower education standard than the rest) from Garissa. Seven apprentices were in their final year of training and left at the end of the year.

Kangaru Agricultural School Site.—A good deal of work has been done here this year, mostly clearing and development. It has been found impossible to keep the bush down except by cultivation or cutting combined with heavy grazing and the assistance of the local cattle owners has been sought in this connexion. In return we get a lot of valuable manure, since the cattle are able to sleep in the buildings already erected.

Education Department and Mission Schools.—Routine visits to schools were carried out by officers when opportunity offered. The standard of agriculture both taught and demonstrated is generally deplorable largely due to the complete lack

of interest in the subject shown by teachers, but the occasional exception is found. The sooner attention is given to the matter by Agricultural Education Officers the better, for the agricultural education of the youth of the country is of vital importance. The Field Officers of this Department have little time to devote to this aspect of work.

That many school gardens are situated on infertile land should be no reason for lack of effort. Similar conditions on certain Government school farms have afforded excellent demonstrations of good farming practice.

Native Agricultural Education.—The number of parties which visited Fort Hall District when soil conservation work was at its height reached alarming proportions and was rather an embarrassment to the officer stationed there. Chief Magugu's location in Kiambu District also drew a number of visiting parties who were most impressed with what they saw.

A party representative of the Meru Coffee Growers visited the Kilimanjaro Native Coffee Growers Union.

A tour was arranged for the Embu School apprentices in their final year. Fort Hall and Kiambu Districts were visited, the Scott Laboratories, the Veterinary Training Centre, Ngong, as well as various factories at Thika.

Vermin, Pests and Diseases

Vermin.—Poisoning and destruction by other means, of vermin continued. Porcupine, ground squirrels, buck, wart hog and bush pig comprise the greatest number destroyed.

The Game Control Officer kept big game under control in Meru and Embu districts.

Insect Pests : Locusts.—The Province was freed of locusts early in the year.

Mealy Bug.—Mild mealy bug outbreaks occurred in Fort Hall, Nyeri and Meru but in most cases were quickly cleared up by the release of parasites.

Root mealy bug and *Fusarium* on pigeon pea was evident but as growing conditions were good, the crop appeared to suffer much less than usual.

Stalk Borer.—Reported from widely scattered areas but little material damage.

Plant Diseases : Fusarium Wilt.—Was not severe for the reasons given in the section above, "Mealy Bug". No sign yet that cultivators will adopt control by rotational methods.

Potato Blight.—A severe outbreak occurred in all potato areas except Meru during the long rains and yields of potatoes were very severely affected. The disease occurred again in the short rains in South Nyeri and Kiambu Districts. The only course will be to adopt blight resistant varieties and in 914 we appear to have a possible one. Unfortunately, "Kinongo" which stood up for so long, collapsed with blight during the year.

Mosaic Disease.—Better weather conditions appear to have allowed cassava to grow away from this disease, though its incidence remains high.

Maize Streak.—Was particularly severe this year as no doubt weather conditions favoured the disease. Maize yields were seriously reduced in the upper and middle areas.

Noxious Weeds : Datura Spp.—Uprooting continues but this noxious weed still makes its appearance on waste lands, near roads, townships and trading centres.

Uprooting of *Mexican Marigold* was organized on a large scale in Embu District but although large areas were cleared temporarily, in many cases uprooting was too late and the seed dropped. Little improvement can be noted in South Nyeri where still vast areas lie for months at a time under this useless weed in a district which is reported to be very short of land.

Clearing of bracken in Meru District particularly, continues. The clearing of the extensive bracken areas in the Province must be tackled in a large way soon and there is little doubt that its replacement by good grazing will prove the solution, Mexican Marigold, Sodom Apple and other useless weeds should be controlled in the same way, that is by laying down land to grass and managing the pasture provided correctly.

Annual Revenue and Expenditure

See Appendix III.

General Remarks

Progress.—With the exception of the political trouble in Fort Hall, which has already been mentioned and which is referred to again below, the year was one of steady rather than spectacular progress. The excellent short rains of 1946–47 followed by the best long rains for many years, removed all signs of the food shortage which had been hanging over large portions of the Province for several years.

The steady progress in Meru reported in the 1946 Report has continued and in this district, largely due to the efforts of the Officers of the Administration and Agricultural Department, the relationship with cultivators is of the very best. Embu also reports very satisfactory progress and if it continues, the district, being less congested than some, has great possibilities of development. Kiambu's manuring campaign continues to achieve further success and whereas this was once looked upon as a most difficult district agriculturally, many of the cultivators need advice and are working on sound lines.

In Fort Hall there is no doubt that the trouble affected more than soil work alone and real development is temporarily at a standstill. The problem district of Machakos reaped two reasonable harvests during the year, which, although not attributable to better farming, were at least an encouragement to the people. No great increase in progress to solve Machakos' problem was made in the reserve, but the information that is being gained from trial plots of grasses is essential before sound advice on reconditioning can be given. Both Kitui and South Nyeri Districts, which in the past have appeared to stand still, made some slight progress in agriculture.

Political Agitation.—The remarks made in the 1946 Report apply equally, if not more so now. The disturbance in Fort Hall proves once again how disastrous can be the influence of a few agitators to the true well-being of the African peoples. The African agitator knows his own people. He knows that anything he does or says which will result in less manual labour, will be received with acclamation by the masses.

Soil Fertility.—Continues to decline and will continue to decline, until there is a much wider appreciation of the problem by the influential African leaders. It is quite useless for these men to assume that some miracle will restore lost fertility or that, for instance, the construction of terraces alone will solve their difficulties. Each district has its men who at least are making an effort to farm well but these men realize very well that it cannot be done without a will to work and their presence on the land most days of the year.

Marketing.—Contrary to the belief expressed in the last Annual Report there was a rapid change over from black marketing to sales through the proper channels, as agricultural products came into free supply. There is little doubt, however, that should shortage occur again, there will be plenty of persons ready to exploit the position.

J. T. MOON,
Senior Agricultural Officer,
Central Province.

APPENDIX I

Rainfall

	1946	*1947*
	Inches	*Inches*
Meru Township	54.13	62.39
Embu Township	48.34	52.47
Nyeri Township	25.61	50.54
Fort Hall Township	47.13	55.45
Kiambu Township	37.25	57.74
Machakos Township	27.13	48.83
Kitui Township	37.92	39.33

APPENDIX II

Statement of Revenue from Produce

Produce	Sales 1946		Sales 1947	
		£		£
Maize and Maize Meal	993 bags	478	180,936 bags	99,514
Millets	1,816 ,,	1,795	18,977 ,,	14,232
Wheat	1,064 ,,	1,135	1,173 ,,	1,216
Legumes	38,665 ,,	108,182	104,557 ,,	195,041
Potatoes	41,349 ,,	43,724	52,188 ,,	33,608
Pyrethrum	—	2,500	—	3,000
Tobacco (flue cured green)	1,075,454 lb.	2,208	1,185,341 lb.	2,939
Tobacco (Native cured)	169,178 ,,	3,583	347,346 ,,	6,465
Coffee Parchment ..	48,714 ,,	1,995	30,095 ,,	1,765
Coffee Mbuni	70,904 ,,	1,205	52,543 ,,	840
Vegetables, Fruit, Flowers	—	118,920	—	114,637
Bananas	635 tons	2,844	6,227 tons	25,723
Onions	7,739 fras.	2,155	16,583 fras.	5,970
Beeswax	1,089 ,,	4,460	979 ,,	4,308
Wattle Bark	28,701 tons	153,530	25,915 tons	187,158
Fuel and Poles	100,000 ,,	25,000	78,475 ,,	24,000
Charcoal	300,000 bags	25,000	305,472 bags	23,523
Hides	22,702 fras.	24,291	16,075 fras.	32,150
Skins	16,084 scores	28,481	32,389 scores	80,472
Ghee	47 tins	101	1,966 tins	1,308
Pigs	690 head	1,593	245 head	588
Poultry	209,121 ,,	22,385	317,508 ,,	39,941
Eggs	7,231,794 eggs	35,493	8,614,920 eggs	36,864
Mtama	—	—	3,569 bags	2,169
Miraa (Catha Edulis) ..	—	—	—	92,793
Miscellaneous	—	5,000	—	9,290
Dried Vegetable Project	—	37,512	—	—
Total Value ..		£ 663,568		£ 1,039,514

APPENDIX III

Expenditure and Revenue, 1947

Agricultural Department	*Expenditure* £	*s.*	*cts.*	*Revenue* £	*s.*	*cts.*
Meru	1,329	2	01	17	17	00
Embu	1,980	8	77		—	
Nyeri	1,454	11	55		—	
Fort Hall	5,237	1	29		—	
Kiambu	1,577	1	52		—	
Machakos	6,458	9	53		—	
Kitui	621	14	98		—	
	£18,658	9	65	£17	17	00

Local Native Council	*Expenditure* £	*s.*	*cts.*	*Revenue* £	*s.*	*cts.*
Meru	3,596	16	14	113	18	91
Embu	2,117	3	92		—	
Nyeri	1,759	0	55	589	4	43
Fort Hall	1,636	18	14	943	15	23
Kiambu	1,191	13	49	842	3	38
Machakos	2,023	17	90	149	10	47
Kitui	1,603	13	14	19	15	88
	£13,929	3	28	£2,658	8	30

ANNUAL REPORT OF THE SENIOR AGRICULTURAL OFFICER, COAST PROVINCE, 1947

Staff

European.

Mr. M. H. Grieve, Senior Agricultural Officer was in charge of the Province throughout the year

KILIFI.

Mr. W. J. Corkhill, Assistant Agricultural Officer from 1-1-47 to 1-7-47.
Mr. R. O. Williams, Agricultural Officer from 1-7-47 to 31-12-47.
Mr. W. G. Jeffery, Temporary Entomologist from 1-1-47 to 31-12-47.
Mr. L. B. L. Evans. Assistant Agricultural Officer from 1-11-47 to 31-12-47.
Mr. V. C. St. G. Giffard, Assistant Soil Conservation Officer from 23-12-47 to 31-12-47.

VOI.

Mr. P. A. Jones, Agricultural Officer from 1-1-47 to 5-2-47.
Mr. F. H. Ormerod, Agricultural Officer from 6-2-47 to 20-10-47.
Mr. G. B. Rattray, Agricultural Officer from 20-10-47 to 31-12-47.

DIGO.

Mr. E. C. M. Green, Assistant Agricultural Officer from 5-12-47 to 31-12-47.
Mr. H. J. York, Assistant Agricultural Officer from 4-9-47 to 31-12-47.

TAVETA.

Mr. E. Bellis, Agricultural Officer from 1-1-47 to 4-7-47.

MAZERAS.

Mr. B. M. Newton, Settlement Officer (seconded) from 23-5-47 to 27-9-47.

Asian.

Mr. W. R. Sethi, Agricultural Assistant at Gede throughout the year.
Mr. S. V. Subba Rau, Agricultural Assistant. Taveta, from 5-3-47 to 20-4-47.
Mr. Abdul Karim, Clerk to the Senior Agricultural Officer at Mombasa throughout the year.

African.

Mr. D. Mbotela, African Agricultural Assistant, Kibarani, from 1-1-47 31-12-47.

	A.D.	*L.N.C.*	*Total*
Clerks	3	—	3
Agricultural Instructors	53	4	57
River Scouts	10	—	10
Soil Conservation Service ..	2	33	35
Vermin Control Staff	—	11	11
Produce Inspectors	—	2	2
Labourers	107	153	260
Sundry Employees	11	2	13

Seasonal Conditions

The favourable 1946 short rains season passed into a normal three months period at the beginning of the year of hot, dry weather. The long rains started in the south at the end of March and worked northwards, and were remarkable for the record-breaking downpours throughout the Coastal belt during May. Gazi, in the south and Malindi in the north both registered some 45 inches of rain during May causing excessive flooding with serious damage to crops. Good rain fell on the Coast during August but petered out in a complete failure of the short rains and drought conditions in many parts of the Coast obtained at the end of the year.

Voi District and the Teita Hills had a satisfactory normal year's weather.

	Inches 1946	*Inches* 1947
Mombasa	46.31	74.07
Kibarani	43.12	59.90
Msambweni	63.05	102.10
Lamu	33.39	39.54
Wundanyi	51.59	52.96

Crops

Food Crops

Maize.—Although it is clear that the Coast is not suitable for maize, it still remains the most popular food and it is planted on every possible and frequently impossible occasion. The excessive rains and droughts affected maize more than any other crop giving rise to the food shortage at the end of the year. Most of the maize grown on the Coast is the multicoloured low-yielding deteriorated mixture of numerous varieties. There is, however, an increasing demand for Yellow Durum maize and plans have been made for seed distribution.

In the Teita Hills the 1946 food shortage resulted in an unfortunate increase in maize planting and consequent depleted acreage of vegetables, but the position has now adjusted itself fairly satisfactorily and it is hoped that in future food shortages will be met by a sufficiency of imported food for sale to the people and so avoid a recurrence of excessive maize planting.

Sorghums and Millets.—As most of the Coastal people prefer to consume maize, the acreage under these crops is unfortunately very limited. It is, however, noticeable that certain local communities plant these foods regularly and efforts are being made to use them as nuclei for increased production.

The Dwarf Hegari sorghum generally does very well on the Coast, and it is being bulked for augmenting future seed issues.

Pulses.—*See* under Economic Crops.

Cassava.—It was a good year for root crops, and this crop comes second only to maize as a staple food. It is indeed rather grown to excess in the Coastal areas of Digo District, where a greater variety of diet would be more beneficial. Increased planting was encouraged in the drier hinterland areas and in Voi District.

Sweet Potatoes.—Good conditions gave increased plantings and considerable quantities were sold in Mombasa.

Bananas.—This popular food is grown mainly in the riverine areas, and finds a ready market in Mombasa.

Rice.—The main staple food in the Tana, Sabaki and Umba riverine areas. It is normally consumed by the great majority of the Coastal people. The crop was well above average this year. Owing to the heavy May rains all swamps were well filled, and planting and harvesting continued over a long period as the swamp water receded. Owing to the low price of 8 cents per lb. for paddy to the producer the whole crop is either consumed locally or finds its way to the Black Market at about 25 cents per lb.

Every effort is being made to encourage an increase in this crop. Variety trials were started and the assistance of two specially trained Rice Instructors have been obtained for the Sabaki Valley.

Coconuts.—The great majority of coconuts grown on the Coast are used for local consumption. The oily-cream expressed from the kernels is a valuable dietary constituent and is widely used for cooking food. The failure of the maize crop on the Coast resulted in increased consumption of coconuts and a consequent reduction in the quantity of copra produced.

Economic Crops

Cotton.—The planting season, just after the heavy May rains was good and the moisture retained in the well-soaked soil gave the young plants a good start, but the failure of the "Vuli" or short rains restricted final growth, and although the final result gave good quality, yields were on the low side.

One hundred tons of cotton seed were issued for Malindi while 11½ tons of cotton seed were issued for Lamu.

The prices paid cents/lb. to the growers were:—

	Malindi	*Lamu*
"A" quality	22	21
"B" quality	6	6

Bales of cotton lint produced:—

	1945/6	*1946/7*	*1947/8*
Malindi	613	1,402	1,134 (estimated)
Lamu	82	38	68
Totals ..	695	1,440	1,202

Cashew Nuts.—Returns show that this valuable tree-crop is steadily increasing in popularity. It grows well almost anywhere within 25 miles of the Coast, it is easy to plant and needs a minimum of care and attention which appeals to the phlegmatic Coast native. The 1947–48 crop promised well and an organized drive was made to get the nuts marketed as they ripened which was well justified and resulted in a record season.

Messrs. W. G. Lillywhite, Limited of Kilifi bought the great bulk of the crop for the processing high grade kernels for the overseas market. Negotiations were started with a view to setting up a factory for the combined production of high grade kernels and shell nut liquid. Every endeavour is being made to increase the production of this crop which has a very promising future.

1946–47 cashew nut crop was as follows:—

	lb.
Kilifi	630,413
Digo	179,677
Malindi	418,061
Mombasa	13,355
Lamu	6,340
Total ..	1,342,362 lb. or 600 tons

The estimated crop for 1947–48 season is over 2,000,000 lb. or 900 tons.

The price paid to the grower was 10 cents per lb. flat rate.

Year	*Raw Nuts lb.*	*Price per lb. cents*
1941–42	768,599	5½
1942–43	1,067,013	5½
1943–44	1,059,556	6
1944–45	484,516	8
1945–46	1,683,955	12
1946–47	1,342,362	10

Simsim.—With the exceptions of parts of Malindi and Lamu District, little interest is taken in the crop which grows well and finds a ready market and a good return to the grower. Seven hundred and twenty-one bags of Black simsim (the Coast variety) were reported sold, but the total crop was undoubtedly considerably in excess of this figure.

Kapok.—Trees yielded well, and those who took the trouble to harvest and market received good returns at 30 cents per lb. The Bondowoso variety is preferred as it does not grow so tall, and the kapok can be harvested more readily. This is another useful tree-crop which is receiving encouragement, and selected seed has been collected for next season.

Some 28,000 lb. were sold in Malindi and one estate in Digo produced nearly 20,000 lb.

Copra.—Owing to the increased local consumption of coconuts, copra production showed a decrease in spite of the recent rise in price. Lamu samples were again of better quality and it would pay producers in other parts of the Coast to take more trouble over thorough drying of the kernels.

Production:—

	Tons
1944	1,000
1945	250
1946	1,783
1947	1,300

The price was Sh. 9/25 and Sh. 9/50 for local and plantation products respectively.

Pulses.—Cowpeas and green gram are grown extensively especially in Kilifi and Malindi districts where most of the crop finds its way on the market for consumption in Mombasa.

More of these crops could be grown with profit in Digo District.

Vegetables.—Considerable and increasing quantities of vegetables for Indian consumption are being grown under irrigation by market gardeners and small holders on the Coast. Those who are fortunate enough to possess a good, adequate water supply and facilities for obtaining *boma* manure are developing this industry which is of great benefit to the Asian community in Mombasa.

European vegetables are grown mainly in the Teita Hills where they have become the most important cash crop. Efforts have been made to get the people interested in growing a wider variety of vegetables, rather than cabbage. However, the latter is an easy crop to grow, requiring little attention, and still remains a firm favourite with the Wateita.

Export figures for the first quarter of the year showed an appreciable decline in vegetable production, compared with the same period in 1946. This was due to the decreased acreage under vegetables consequent upon the 1946 famine, which was directly responsible for an increased acreage under maize.

For the remaining period of the year, however, exports of vegetables rose very considerably as the following figures show:—

Exports in lb. (whole Teita)

	1947		*1946*
	lb.		*lb.*
1st Quarter ..	103,425	1st Quarter ..	168,534
2nd Quarter ..	270,873	2nd Quarter ..	164,866
3rd Quarter ..	562,798	3rd Quarter ..	423,858
4th Quarter ..	636,768	4th Quarter ..	332,826
Total ..	1,573,864	Total ..	1,090,084

Every effort has been made to improve the quality and selection of vegetables marketed, but there is still room for further improvements.

Fruit.—The potentialities for fruit production on the Coast are well known and the Agrarian Liaison Officer is undertaking a special investigation of the whole subject. It is also proposed to establish a Sub-tropical Fruit Station near Mombasa as soon as possible.

It was rather a disappointing year for fruit. Supplies of good mangoes came from Lamu; pineapples and pawpaws were fairly plentiful, but citrus fruits were well below average. There are few real fruit farmers, most of the fruit coming from the owners of a few trees.

Tobacco.—With the exception of Pate Island near Lamu tobacco is grown only on a small scale.

The Pate producers have established in the course of years an interesting and profitable industry. They grow a variety of tobacco which is in great demand in Somalia and practically the whole crop from Pate is shipped by dhow to Mogadishu.

The 1947 crop was as follows:—

42,369 lb. of tobacco at Sh. 21 per frasila.

1,789 lb. of tobacco at Sh. 18 per frasila.

This gave a revenue to the producers of some Sh. 26,109.

Plantations Crops.—Large companies operating on the Coast are engaged in the production of sugar and sisal.

QUANTITIES OF CROP PRODUCE MARKETED WITH VALUE TO THE PRODUCER

COMMODITY	Unit	1946		1947	
		Quantity	Value	Quantity	Value
			£		£
Maize	Bags	374	579	16	25
Mtama	,,	—	—	239	300
Simsim	,,	360	445	400	750
Gram	Tons	130	1,640	400	5,464
Cowpeas	,,	300	4,080	250	3,415
Sweet Potatoes	Bags	50	14	400	140
Cassava	,,	500	140	500	140
Fruit	—	—	30,000	—	20,000
Vegetables	Lbs.	1,090,084	5,450	1,573,864	7,869
Betel Nuts and Leaves	—	—	170	—	170
Rice (Paddy)	Tons	720	15,840	1,200	26,400
Rice (Hulled)	Bags	1,994	330	7,980	2,394
Coconuts	Nuts	250,000	1,000	500,000	2,500
Copra	Tons	1,783	44,575	1,300	39,000
Cashew Nuts	,,	642 (1946/47)	7,190	900 (1947/48)	10,080
Cotton	Lbs.	1,891,001	16,839	1,461,600	17,400
Kapok	,,	30,000	375	50,000	750
Tobacco	,,	—	—	55,178	1,937
Mkoma Mats and Bags	Tons	—	—	500	10,000
		£	128,667	£	155,534

Soil Conservation

The year was marked by an increasing appreciation, both by the people on the land and by Government Officers and staff of the need for immediate and intensified action to check soil erosion in the more affected areas.

A Soil Conservation Scheme for the Teita Hills was drawn up with a view to augmenting the present services in the Voi District and to make the hilly country safe for the production of high value crops such as vegetables, coffee and fruit. It is anticipated that this scheme will be put into effect in 1948.

Good progress has been made on the lines pursued previously, i.e. contouring for the construction of broad-based terraces in the lower foothills and contouring for trash lines and live wash-stops in the hills. The planting of Coleus wash-stops in the areas in the hills already contoured continued during the first six months of the year.

Good progress was achieved in Lower Mbale and Sagalla locations with the planting of river banks with napier grass.

The manuring of *shambas* still leaves much to be desired, in spite of continual propaganda from this Department.

The planting of grass on disused *shambas* and eroded hillsides is still not as popular a practice as it should be.

The following figures summarize the soil conservation work which has been done during the year.

Contoured for terraces. (Two men in team). Mbololo location:—

	Length contoured	*Area*
	Yards	*Acres*
1st Quarter	21,779 (12.4 miles)	337.5
2nd Quarter	15,403 (8.8 miles)	175.7
3rd Quarter	14,638 (8.3 miles)	151.2
4th Quarter	12,743 (7.2 miles)	131.6
Total ..	64,563 (36.7 miles)	796.0

Contoured for trash-lines and live wash-stops. (Four men in each team):—

	Length contoured	*Area*
	Yards	*Acres*
1st Quarter	183,284 (104.1 miles)	145.6
2nd Quarter	469,454 (266.7 miles)	482.0
3rd Quarter	574,629 (326.5 miles)	587.5
4th Quarter	570,083 (324.0 miles)	500.0
Total ..	1,797,450 (1,021.3 miles)	1,715.1

A special effort was made in the Mazeras area to control the cultivation on steep slopes.

In the Rabai area the closure of 47 holdings too steep for cultivation was carried out, and 31 summonses for recultivation were made and 29 convictions obtained under the appropriate Local Native Council resolutions.

The application of control to the notoriously eroded Mambrui Hills could not be carried out on account of land tenure difficulties and the alternative of persuasion has not proved effective. Efforts to remedy this are, however, being undertaken.

The picture with regard to preparations made for the future is, however, much more favourable particularly with regard to additional European staff.

One Assistant Agricultural Officer was in the District for posting to Malindi early in 1948 and will be able to give attention to the Mambrui Hills which are badly in need of comprehensive soil conservation and the problem of the protection of the banks of the Galana River. A second Assistant Agricultural Officer was stationed in the Southern Kilifi hilly locations in December, ready to start on the work of closing steep land in that area.

Of great value for the future was the training in line levelling, under a Soil Conservation Service Leveller at Mazeras, of over 40 Agricultural Instructors and River Scouts. At the time of writing confirmation of estimates for the employment of six line levelling teams had not been received, but these teams should be in action on defined topographical units of country early in 1948. The programme of work for 1948 including the closure of land to cultivation steeper than 20 per cent. the laying of trash lines, the start of narrow-based terracing with the line level teams previously mentioned, control of burning, protection of river and stream banks and the increased use of manure has been explained to Agricultural Instructors and their methods of work are planned to facilitate ease of "follow up".

Education

Preparations were made for the re-opening of the Agricultural Training School at Kibarani early in 1948. It is confidently anticipated that a better and more intelligent type of youth will come forward for this training. The Coast has been seriously handicapped by the rather low grade types which have had to be accepted for training in the past.

Officers and Instructors have visited schools and school gardens throughout the Province giving advice and instructions. In the Teita Hills the Agricultural Instructor for Schools has carried out his monthly programme of visits and instruction to schools. An encouraging sign in the district is that schools seem to be keen to obtain all the help they can in agricultural matters, from the Agricultural Officer and his staff.

Experimental

Kibarani.—Experimental work has not been carried on to anything like the same extent as it was prior to the abandonment of the farm during the war and apart from the permanent phosphate experiment, the majority of work is concerned with seed-bulking, plant trials and the establishment of citrus and other fruit trees which will serve as a useful source of propagation material in the future. The formulation of an experiment plan of a long term nature was not considered worth while in view of the projected plans for a new Coast Experiment Station. Plans for experiment work in 1948 are of a short term nature.

Recording calculations and running of experimental work is carried on by the African Agricultural Assistant and the following is a summary of results obtained:—

(1) *Hybrid Maize.*—Varieties received from the Senior Plant Breeder were planted but the crop was a failure because of drought.

(2) *Dwarf Hegari Sorghum.*—Five acres planted in April was damaged by 31.8 inches of rain which fell in May. An application of sulphate of ammonia was applied to stimulate growth but the yield was only 380 lb. per acre.

(3) *Sorghum Varieties* (*ex-U.S.A.*).—The following varieties established themselves well and seed was collected for further larger scale trials:—

(*a*) Caprock.
(*b*) Chinese Amber Mn. 23.
(*c*) Rex Mn. 4.
(*d*) Collier Mn. 45.
(*e*) White African.

(4) *Groundnuts.*—Groundnuts were planted on the Permanent Phosphate Experiment. Observations were made on:—

(*a*) Response between different rates of phosphate dressings on final yields.
(*b*) Germination.
(*c*) Wilt incidence and its effect on the final yields.

The table below summarizes the results:—

Dressing S.P. 1946	Percentage Germ	Yield of Unshelled Nuts in Pounds		Total	Average Yield Pound/ Acre
		Wilted Plants	Unwilted Plants		
1. Control	43·6	6·3	145·6	151·9	850·9
2. 100 lb./acre	55·5	4·0	156·7	160·7	902·2
3. 200 lb./acre	50·1	5·0	148·6	153·6	864·4
4. 200 lb./acre U.R.P. ..	50·6	4·0	173·5	177·5	994·3
5. 400 lb./acre U.R.P. ..	46·6	4·3	139·0	143·3	802·7
Mean	48·9	4·7	152·7	157·4	882·9

Results:—

(*a*) No response to different silicophosphate dressings.

(*b*) Small significant differences in germination were recorded. All silicophosphate dressings were better than the control. The order of best germination is shown in the table above.

(*c*) Percentage wilt was 7.4 and its affect was to depress the final yield by 4.9 per cent or 45 lb. per acre.

Trials under the United Africa Company Groundnut Scheme.—Two one-acre trials of groundnuts were carried out by the Asian Agricultural Assistant at the request of the United Africa Co., at Kambi ya Waya and at Msumarini respectively. Each acre plot was divided into four, and one-quarter of an acre was planted with Coast seed. The remaining plots were planted with seed from Nyanza Province. All spacing was 18 in. by 12 in. The following table summarizes the results:—

	Kambi ya Waya			Msumarini		
	Kisumu Seed		Coast Seed	Kisumu Seed		Coast Seed
1. Growing Period in Days	3	136		2	134	
	4	140		3	138	
	2	131		4	140	
	Average	136	163	Average	137	163
2. Percentage Wilted Plants	3	2·7		2	4·1	
	4	7·0		3	2·6	
	2	11·7		4	7·4	
	Average	7·1	7·2	Average	4·7	25·8
3. Percentage Germination	3	80		2	85	
	4	90		3	79	
	2	79		4	89	
	Average	83	87	Average	84	94
4. Yield lb./acre	3	2,592		2	1,732	
	4	1,712		3	1,564	
	2	2,324*		4	1,052	
	Average	2,209	1,472	Average	1,449	1,628

* Part Kisumu and part Coast seed.

Total yield per acre: 1,759.5 lb.
Average percentage wilt (all plots): 11.2 per cent.
Average percentage germination (all plots): 87 per cent.
Average growing period: 150 days.

Great care was taken with the selection of seed from good healthy plants and seed from wilted plants was kept separate.

Citrus.—The following varieties of citrus were established in a new orchard for future supplies of planting material: Valencia, Navelencia, Muheza Oranges, Meyer Lemon, Sweet Lime

Numerous Rough Lemon and Zanzibar Seedlings were established for stock but no budding material was obtained except for some from Ziwani (Colonel Grogan's estate) in too dry condition. West Indian Lime Seedlings were grown and distributed to Gede Settlement.

Grasses: Stenotaphrum dimidiatum.—Pemba Grass introduced from Zanzibar established itself well but has since been found growing locally. The grass is of running habit, grows very thickly and appears suitable for soil conservation work and is noted for grazing in Zanzibar. It appears to stand drought although found growing locally in damp places.

Axonopus compressus, also introduced from Zanzibar. Established itself less rapidly and does not stand drought well.

Eragrostis curvula.—Has become well established.

Penisetum pedicellatum.—This West African grass has done well and seeded.

Wundanyi Estate.—The most important work which has been carried out this year on the farm, has been the trial of numerous vegetable varieties. Seed was purchased in Nairobi and planted during the short rains.

Most of the varieties tried have proved successful and the trials have shown to the people of the vegetable growing areas in the hills, that something more than the universal cabbage can be grown, with some care and attention.

Pests and Diseases

Locusts.—Except for a small batch of hoppers at Tsavo, no locusts were reported.

Vermin.—Organized control was maintained in Digo District where monkeys, wild pigs anr porcupines cause considerable damage to crops.

Insect Pests.—The most important are scale insects on citrus and mangoes, cotton stainers, coconut beetle, grain weevils and stalk borer on maize. Demonstration with 1 per cent D.D.T./Diatomite were carried out against the last-named pest in Voi District.

Disease.—Head smut of maize was reported from the Teita Hills. Leaf Mosaic on cassava and groundnut wilt are still prevalent. Potato blight seriously affected the Teita Hill crop.

African Settlements

Gede.—The Department continued to provide the Settlement with the services of an Indian Agricultural Assistant and six Agricultural Instructors.

Although the seasons were not so favourable as in the previous year, it is estimated that the total value of crops sold was Sh. 50,000, much of which is used for the purchase of maize the acreage of which is controlled in the Settlement.

Three thousand two hundred coconuts were raised and issued, and a further 3,000 will be ready for 1948.

Taveta.—The war-time irrigation scheme was wound up and the Agricultural Officer was not replaced when he left in July. The control of irrigation on Block C was, however, maintained with a view to the adoption of a suitable land utilization scheme in the future.

Lamu-Witu.—An investigation of the area from the agricultural point of view was carried out with a view to the establishment of African Settlements.

Close liaison with the African Land Utilization and Settlement Board was maintained throughout the year.

Conclusion and Acknowledgments

In spite of the extreme vagaries of the weather, the year was on the whole fairly prosperous, though deteriorating towards the end. The establishment of a big military camp at Mackinnon Road has opened up possibilities for the marketing of local produce. The development of the vast area of latent fertility in the Tana Delta is under consideration, and negotiations are under way for the establishment of a Central Agricultural Training School, Experimental Station and Sub-tropical Fruit Station, near Mombasa.

The increase in European agricultural staff from 3 to 9 officers during the year has already enabled many urgent tasks to be tackled and development schemes started which would have been impossible otherwise.

In conclusion, the ready assistance and co-operation of the Provincial Administration and the staff of the Agricultural Department must be recorded and gratefully acknowledged.

M. H. GRIEVE,
Senior Agricultural Officer, Coast.

RIFT VALLEY PROVINCE

The provincial organization was in abeyance when this report was written; the reports of the agricultural officers in charge of the European areas are therefore printed in full in lieu of a report by the Provincial Officer.

ANNUAL REPORT FOR NAKURU DISTRICT, 1947

Staff

Mr. A. Storrar was District Agricultural Officer throughout the year until 4th November when Mr. F. H. Ormerod took over and remained at Njoro for the rest of the year.

Weather Conditions

A very wet year was experienced with prolonged early rains. Towards the end of the year droughty conditions were experienced.

Rainfall figures (Plant Breeding Station, Njoro) were as follows:—

Month	*1947* *Inches*	*Average of 19 years* *Inches*
January	3.37	0.86
February	1.19	1.11
March	3.87	2.72
April	9.82	4.42
May	7.54	4.19
June	4.56	3.61
July	4.83	4.92
August	5.73	5.05
September	5.12	2.37
October	2.14	1.78
November	0.89	2.65
December	1.74	1.68
	50.80	35.36

Stock

Stock tended to go short of grazing towards the end of the year. During 1947, however, more farmers appear to have conserved food for the dry period.

Crops

Crops in general suffered badly from the heavy early rains, the later planted crops giving the better yields. Wheat yields were particularly poor in some areas whereas maize yields were somewhat above the average.

Estimates of yields of cereal crops for the 1947 season were as follows (figures in bags per acre):—

Area	*Wheat*	*Maize*	*Barley*	*Oats*
Londiani	4.5	8	8	7
Rongai/Elburgon	2.5	10	4	—
Subukia	4.5	11	8	—
Mau/Molo	5.0	—	9	9
Eldama Ravine	4.0	8	5	5
Solai	2.5	8	5	5
Mereoni	2.5	9	4	—
Njoro	4.5	10	7	6

Marketing

Grading and Inspection services at the recognized rail-head centres were maintained throughout the year.

Soil Conservation

The following is a summary of work carried out by the Soil Conservation Service during the year:—

Broad base terracing: 2,652.3 acres, 220.6 miles.

Narrow base terracing: 318.3 acres, 56.0 miles.

Bench terracing: 4.0 acres.

Strip cropping: 100 acres marked out.

Contour ploughing: 1,235 acres marked.

Roads: 31,366 yards constructed.

Drainage ways: 4,417 yards, capacity 1,389 cu. secs.

Cut-off drains: 11,677 yards, capacity 2,612.5 cu. secs.

Training banks: 11,400 yards constructed.

Earth excavated for high spots: 198,950 cu. ft.

Shortage and unreliability of machinery and the prolonged rains appear to have been limiting factors to progress throughout the year.

Experimental Work

A comprehensive programme of experimentation was initiated at both Rongai and Molo during the early part of the year.

Rongai Plots.—Of the crops under trial the following showed promise: Mariout barley, buckwheat, Hungarian linseed, safflower, Boston beans, broad beans, horse beans, Mauritius peas, Dolichos (white), Victory beans, Alabama black beans, Hubam clover, Rhodesian Sudan grass, *Panicum makarikariensis,* Molasses grass, purple vetch, *Tephrosia Vogelli, Cenchrus ciliaris.*

Molo Plots.—Promising results were obtained from the following crops: Argentine lucerne, sainfoin, *Phalaris tuberosa,* Hubam clover, Hungarian linseed, yellow mustard, Irish I.R.G. (Giant Lurgan), Olsgaard Danish cocksfoot, *Bromus marginatus, Beckeropsis uniseta.*

Pasture Experiment: Soysambu.—The experiment was started and maintained throughout the year and a capital expenditure of almost £400 incurred on posts, fencing, etc. It will, of course, be some time before any results are apparent from this experiment.

Farming in 1948

With the present prices of cereals a drop in the acreage under the plough can hardly be expected.

A. STORRAR,
Agricultural Officer.

ANNUAL REPORT FOR KITALE STATION, 1947

Staff

Mr. R. E. T. Hobbs, Senior Agricultural Officer, was in charge of the Kitale Experimental Station and carried out general advisory work in connexion with crops and stock in the Trans Nzoia and Uasin Gishu districts. Mr. Hobbs proceeded on home leave in July.

Mr. L. R. N. Strange, Assistant Agricultural Officer, was stationed in Eldoret and carried out general advisory work in connexion with crops in the Uasin Gishu District.

Mr. J. T. T. Schouten, Assistant Agricultural Officer, stationed at Kitale, was in charge of experimental and advisory work on coffee in all areas west of the Rift. On the Senior Agricultural Officer's departure he was in charge of the Kitale Eperimental Station and general advisory work of the Trans Nzoia District.

Mr. D. Wolff, Field Assistant, was in charge of the Waterkyn farm.

Mr. Grundy, Assistant Chemist, was stationed at Kitale for a period of a month to investigate methods of manufacture of silicophosphate.

Meteorological

The rainfall for the year was again above average. The period January to March, in which the average rainfall totals under 5 inches, this year brought over 10 inches. The increased rainfall during this time provided the district with a cultivation and preparation of land problem and a heavy stalk-borer infestation when the maize lands were planted. The rainfall was generally favourable to wheat farmers in the Endebess area.

Rainfall	*1947 Inches*	*14 years average Inches*
January	4.68	0.80
February	2.50	1.62
March	2.89	2.34
April	7.67	6.41
May	7.70	7.25
June	2.45	5.89
July	7.50	6.38
August	6.76	6.84
September	3.59	3.87
October	2.17	2.17
November	0.71	2.14
December	1.74	1.35
Totals	50.36	47.06

Storms of the following intensities were recorded on the Friez self-recording rain gauge:—

Date	Total Fall	Intensity
10th January, 1947	2·16 inches	1·6 inches in 30 minutes
15th January, 1947	1·31 ,,	1·00 ,, ,, 30 ,,
23rd April, 1947	1·38 ,,	0·60 ,, ,, 10 ,,
5th May, 1947	1·68 ,,	1·0 ,, ,, 15 ,,
17th July, 1947	0·93 ,,	0·93 ,, ,, 30 ,,
4th August, 1947	0·90 ,,	0·90 ,, ,, 15 ,,
31st August, 1947	1·13 ,,	1·13 ,, ,, 40 ,,
23rd September, 1947	1·34 ,,	1·20 ,, ,, 10 ,,
6th October, 1947	0·61 ,,	0·61 ,, ,, 10 ,,

Experimental Station

The acreages under cultivation of various crops during the year were as follows:—

	Acres
Coffee	21
Maize	57
Ensilage (maize)	9
Nursery and trial plots	4
Temporary grass leys	64
Improved veldt grazing	182
Tree plantation and wind breaks	53

The farm rotation as replanned last year has been followed with a few minor alterations for the sake of farm requirements. In order to carry out the programme for the year the following work was done:—

Breaking veldt grass land and preparation for maize	30 acres
Ploughing three-year old grass ley and preparation for maize	19 „
Contour terracing	49 „
Land sown to grass	23 „
Land growing maize underseeded with grass to return to temporary grass ley after harvest	22 „
Fencing	1,900 yards
Piping (water troughs)	1,600 feet
Tree planting	11 acres

Water troughs have been constructed to provide water for grazing cattle as and when the lands revert to temporary grass leys.

A further manure *boma* has been constructed to facilitate handling and making manure from the new lands brought into the farming programme. A school was constructed in the native camp and is attended by children with evening classes for the labourers themselves.

Expenditure and revenue during the year were as follows:—

A.—*Capital.*	*Sh.*	*cts.*
Implements	481	30
Building and water supplies	1,704	84
Fencing	752	14
Livestock	—	—
Labour rations	2,148	40
Total	5,086	68

B.—*Running.*	*Sh.*	*cts.*
Manure, seeds, sprays	749	20
Repairs, renewals and small tools	2,338	16
Feeding stuffs and veterinary upkeep	5,165	23
Fuel, oil and lorry transport	3,736	76
Miscellaneous	271	65
Labour	10,154	69
Rations	1,578	08
Total	23,993	77

Revenue—	*Sh.*	*cts*
Sale of pigs	7,038	75
Sale of coffee	2,679	75
Sale of butterfat	3,634	59
Sale of milk	982	37
Sale of live stock	—	—
Total ..	14,335	46

Crops

Maize.—The maize acreages in the Trans Nzoia for the seven years 1941–47 are as follows:—

1941	1942	1943	1944	1945	1946	1947
40,000	37,649	47,886	55,006	58,906	51,389	51,840

This year's figure of planted maize is a small increase over the previous year but includes 2,028 acres of yellow maize planted. The yield of the district will undoubtedly prove to be lower than in 1946. After planting some maize lands were reploughed in an effort to re-sow to barley and oats.

Average yields in bags per acre for the six years 1942–47 are as follows. The yield for 1946 being an estimate.

1942	1943	1944	1945	1946	1947
8.5	8.3	8.3	7.3	7.2	6.5

The yield of the district is estimated to be lower than previous years. Rainfall occurring at the time of land preparation and the incidence of a heavy stalk borer infestation, being the chief causes. A seed maize competition was conducted on the Kitale Experimental farm during the year. The Department received 14 entries. Tabulated results have been made and reported on. Most entries were received from farmers of the district.

Theft of maize by natives, is increasingly becoming a problem of the district.

Wheat.—The wheat acreages in the Trans Nzoia for the seven years 1941–47 are as follows:—

1941	1942	1943	1944	1945	1946	1947
8,000	7,651	7,224	8,709	10,714	13,078	13,381

Average yields in bags per acre for the six years 1942–47 are as follows, the yield for 1947 being an estimate.

1942	1943	1944	1945	1946	1947
4.1	4.9	4.5	4.6	4.16	4.0

Wheat crops, generally, were up to average standard during the year, the crops in the Endebess area being perhaps above average. Of the wheats planted Regent did particularly well, although susceptible did not fall to stem rust and harvested well. New wheats being grown for seed by various farmers of the district, which showed promise were 294 M.7.C.6.A., 261 R.7.C.I.B., the latter, bearded wheat, being particularly useful as an alternative to K.G. maturing in 119 days at Endebess. K.G. and Simpson's Rongai wheats in the district were disappointing due to stem rust which in one case completely destroyed the crop.

Coffee.—The early rains at the beginning of the year favoured coffee and generally it looked in good heart with good average crops. Crops yields were lower on those farms which had cropped in the previous year and where the coffee tended to produce fruit once in two years.

Other Crops.—Planting programme of the district included the following crops:—

	Acres
Potatoes	210
Peas	216
Beans	379
Fodder	2,017
Grass leys	3,118
Sunflowers	2,400
Linseed and flax	214
Wattle	2,036
Tobacco	20
Squatter maize	2,471

With regard to the above crops, the district's interest was chiefly focussed on grass leys and sunflowers. Numerous farmers have obtained seed of molasses grass (*Melinis Minutiflora*) and Trans Nzoia Rhodes Grass (*Chloris gayana*) and although the seed position is such that further distribution is impossible, it is hoped that these farmers will have bulked enough seed for their own purposes with some to spare this next season.

The increased price of sunflower seed has influenced farmers to put land down to this crop.

Pests

Chafer Grub.—The damage done by this pest was limited in the district. Investigational work consisted in applying gammexane at different levels using a system feasible to farm scale operation. The gammexane was "drilled" in at the following rates:—

20 lb. gammexane per acre.

40 lb. gammexane per acre.

80 lb. gammexane per acre.

160 lb. gammexane per acre.

This experiment was repeated on two farms but from observations made no marked result was noticeable.

Stalk Borer.—This was the major pest in the maize of the district this year. As a result of previous investigational work farmers were enabled to stem an appreciable proportion of the pest using D.D.T. diatomite powder mixture, sodium fluosilicate solution, and derrisol. However the infestation was severe despite remedial measures taken and public demand for insecticides was greater than could be supplied.

Locusts.—No damage was suffered by crops of the district from locusts.

Noxious Weeds

Datura stramonium is still very present in the wheat lands of the district.

Soil Conservation

Further orders prohibiting cultivation on worn-out arable lands have been served to farmers. These numbered 80 during the year. In advisory work stress has been laid against continual maize cropping. Farmers have been recommended a rotation similar to that practised at the Kitale Experimental Station to include temporary grass leys. Local agents for machinery have been aware of difficulties of using farm implements on terraced land and have taken opportunities of trying and demonstrating their machines on the Experimental farm.

Routine and Advisory

Numerous visits have been paid to farmers especially new settlers in the district to advise on general farming matters. Tours have been arranged, conducted through the district for students attending the Egerton School of Agriculture.

Investigational

Fertilizer Trials.—The statistical experiment started the previous year was resumed to test the effects of varying rates of applications of Uganda Rock phosphates and silicophosphate. This year the recording of treatments was made on green weights of silage maize. This crop proved to be an unsatisfactory one from the point of view of statistics and tended to show little or no difference in treatments.

The treatments were as follows:—

A. Control.

B. Silicophosphate 100 lb. per acre.

C. Silicophosphate 200 lb. per acre.

D. Uganda Rock Phosphate 200 lb. per acre.

E. Uganda Rock Phosphate 400 lb. per acre.

Tabulated results in bags per acre for the first year's (1946) crop which was maize, are as follows:—

	A	*B*	*C*	*D*	*E*	*Mean*	*Standard Error*
	21·36	25·20	23·02	22·32	23·02	22·93	1·45
Per cent. of mean	93·2	109·9	100·4	97·3	104·4	100	6·3

There was no significant difference between any of the treatments.

Tabulated results in tons of silage per acre for the 2nd year's crop, are as follows:—

	A	*B*	*C*	*D*	*E*	*Mean*	*Standard Error*
	19·9	19·3	18·8	17·0	18·4		
Per cent. of mean	106·4	103·2	100·5	90·9	98·7	100	

There was no significant difference between any of the treatments.

Plant Trials.—Trials were made of Hybrid maize types and tabulated results of germination and shelled grain weights, etc., are as follows:—

Type	No. of Seed Planted	No. of Seed Germinated	No. of Plants at Harvest	No. of Cobs	No. of Nubbins	Weight of Shelled Grain
						lb.
Texas White Hybrid No. 9	50	44	42	35	11	5·2
Stowel Evergreen ..	50	39	21	11	11	1·2
Texas Yellow Hybrid No. 10 ..	35	29	28	20	8	3·9
Texas Yellow Hybrid No. 12 ..	50	47	46	39	9	6·8
Pontiac	50	33	24	22	21	2·4

Results from any of the varieties were not imposing.

Soya Beans.—A trial was made of eighteen varieties of soya beans at the itale Experimental Station. The varieties included types from Maseno, Uganda id Potchefstroom. The germination of the beans was so poor to make recording npossible.

Pasture Trials.—Further work has been done on the Experimental Station id on farms in the district on grass leys. During the year arable land has ccessfully been reverted to Rhodes grass and Molasses grass fields under nurse ops of maize. An annual red clover *Trifolium Studenerii* has been bulked up the Experimental Station and seed is now available for field trials.

Cattle.—Lactation Records of all cows on the Experimental farm were kept roughout the year. To divide these cows into four types, there are as follows:—

A. Native cows, purchased for stocking the farm. Records of the parents unknown.

B. Grade shorthorn cows, purchased for stocking the farm. Records of the parents unknown. Also progeny of these cows by two grade shorthorn bulls.

C. First and second crosses from native cows in class A with grade shorthorn bulls.

D. First crosses from native cows with pure Guernsey bulls.

The average lactations to date give the following results. The figures from ass D are based on six lactations only, no more data being available, but all are t calf lactations.

	Average Lactation Gallons
A. Native	82.2
B. Grade Shorthorn	420.1
C. 1st and 2nd Cross Grade	330.4
D. 1st Cross Pure Guernsey	459.4

In appearance, undoubtedly, class D are outstanding for their condition and rformance during the dry months which are expected at the end of each year the district. The experimental station herd has continued to be run using ificial insemination. During the year 46 successful pregnancy diagnoses have en recorded at an average of two inseminations per calf.

Pigs.—Imported Wessex Saddleback sows were kept on the experimental rm. The work of breeding and distributing pedigree Wessex gilts was done for e Pig Industry Board. Gilts have been sent to Kitale, Plateau, Fort Ternan, Joro Orok. During the year 30 pigs have been distributed to farmers.

J. T. T. SCHOUTEN,
Assistant Agricultural Officer.

ANNUAL REPORT FOR THE UASIN GISHU, 1947

Staff

Mr. L. R. N. Strange was stationed in Eldoret and carried out genera advisory work in the Uasin Gishu as Assistant Agricultural Officer under M Hobbs, Senior Agricultural Officer, Kitale.

As from 1st October, Mr. Strange undertook the duties of Executive Office to the Uasin Gishu Production and Man Power Committee. Miss B. Finch Secretary to the Production Committee, has assisted with Departmental corre pondence and office work.

Meteorological

This has been a year of exceptionally heavy rain starting in January an going right through to October. The result was that in many cases land was no well prepared. Weed growth was strong, and there was considerable waterloggin with poor growing conditions for crops.

Rainfall	*1947* *Inches*	*17 Years' Average* *Inches*
January	3.25	.80
February	2.25	1.84
March	2.63	2.23
April	8.60	5.00
May	4.26	4.70
June	2.90	4.23
July	11.28	7.59
August	8.00	7.84
September	2.77	3.07
October	3.03	1.44
November	—	1.67
December	2.42	1.09
Totals	51.39	41.50

Crops

Maize.—Maize acreages in the Uasin Gishu for the seven years, 1941–4 were as follows:—

1941	1942	1943	1944	1945	1946	194
12,512	14,933	21,266	25,044	26,126	20,949	21,90

Average yield in bags per acre for the six years 1942–47 were as follows, th yield for 1947 being an estimate:—

1942	1943	1944	1945	1946	1947
5.3	5.9	6.6	4.7	5.7	5.5

This has been a disappointing maize year, crops being poorer than thos obtained in 1946. Stalk borer attack was serious, showing an increase over th previous season. This fact has been the cause of considerable loss. The mai control measure used was sodium fluosilicate which proved effective when applie in time.

Hail damage was unusually severe in the Turbo-Kipkarren area resultin in almost total crop failure on some fields.

Wheat.—Wheat acreages in the Uasin Gishu for the seven years 1941–47 were as follows:—

1941	1942	1943	1944	1945	1946	1947
45,816	57,724	60,921	67,313	74,682	79,668	82,478

Note.—The 1947 figure is the total given out on planting orders. The actual acreage was probably less.

Average yields in bags per acre for the six years 1942–47 were as follows, the yield for 1947 being an estimate:—

1942	1943	1944	1945	1946	1947
2.5	4.2	3.3	4.3	3.6	3.4

As in the case of maize, 1947 has been a poor year. The main reason was excessive rain during the growing period. Added to this, fertilizers were in short supply, and stem-rust caused some loss. In a number of cases heavy stands turned out disappointing due to ears not having set seed. There have been 12 claims for the Guaranteed Minimum Return so far.

The last minute increase in price to Sh. 31/50 (to the agent) has given general satisfaction although some individuals still feel this to be too low. These price increases, while helping to maintain production, at the same time have the adverse effect of encouraging planting on marginal land, and discouraging the much needed change to mixed farming.

Barley.—A small acreage was planted, mainly for feed purposes. Results on the whole have been poor due to heavy rain. A total of 770 acres was planted (i.e. the total given in planting programmes) in 1947, compared with 694 acres in 1946.

Oats.—A total of 1,862 acres (i.e. the total given in planting programmes) was planted in 1947, compared with 807 acres in 1946. Results have not come up to expectations, the estimated average yield being 5.7 per acre.

Flax.—A total of 140 acres only was planted mainly by individuals who have their own processing machinery.

Linseed.—Sudden interest in this crop was taken in the month of August after promises of seed supplies and high prices had been published. Unfortunately, the seed arrived too late to be of much use. Those farmers who did plant Canadian linseed have obtained disappointing results, mainly due to late sowing.

Peas and Beans.—Some interest has been taken in the production of seed of garden pea and bean varieties. The beans, mainly dwarf kidney, have given fair results in the Moiben area where rainfall is lowest (annual average about 38 inches). Excessive rain has had a detrimental effect on the yield of peas, although it is thought that after more experience with the handling of this crop, satisfactory results will be obtained in the higher rainfall areas such as Kipkabus, Burnt Forest, Kaptagat, etc.

Soya Beans.—Mr. J. C. Ferree, visited this district in November for the purpose of encouraging trial plantings of soya beans. So far 15 farmers have applied for seed, and wish to plant trials of from two to five acres each during 1948 in various parts of the district.

Pyrethrum.—The sudden collapse of the pyrethrum market caused much consternation amongst growers who have relied largely on this crop as their chief source of income. As a result acreages are being reduced all round, and it is probable that only those people with the new high toxic strain will continue in production.

Sunflowers (for seed).—Three hundred and five acres were planted with sunflowers for seed. It is certain that the acreage under this crop will be considerably increased in 1948 as a result of recent price increases.

Black Wattle.—The East African Tanning Extract Co., Ltd., has started work on the building of an extract factory near Eldoret. This will be capable of producing 1,500 tons of extract per month. In order to keep this factory in full production, approximately 100,000 acres will have to be planted. The Extract Company hopes to obtain sufficient land of their own for the planting of 50,000 acres to ensure guaranteed supplies to the factory, and they hope private growers will produce the other 50,000 acres. To date the Company has purchased 41,785 acres of land in the Uasin Gishu.

Due to the recent increase in the price of dried bark to Sh. 200 per ton and the likelihood of a firm market in future, many farmers are increasing their production of this crop. There are now, 18,632 acres under wattle of varying ages in the district as compared with 15,514 in 1946.

Phormium tenax (New Zealand Flax).—In spite of discouraging reports from London on the marketing prospects of this crop, increasing interest is being shown in the southern part of this district, i.e. Burnt Forest, Kipkabus, Kaptagat, Ainabkoi, etc., and the total area planted with Phormium is 1,870 acres.

Fruit.—During the year Mr. T. H. Jackson, the Departmental Fruit Expert, has paid a number of visits to farms in the district. As a result of these visits, cultural methods have improved and acreages are likely to be increased.

Particular encouragement has been given to farmers in the Turbo area to enlarge acreages under citrus fruit, which is known to do particularly well in that part of the district.

Fertilizers

In order to counteract the shortage of superphosphates, an effort was made to encourage the manufacture of soda phosphate, (silicophosphate), by farmers in home-made kilns. There was considerable success, and at least thirty farmers were persuaded to make this fertilizer on their farms. The most important outcome of this work has been:—

(*a*) It has shown clearly that soda phosphate gives good results, particularly on the plateau soils.

(*b*) A company has been formed for the commercial production of soda phosphate in Eldoret. They expect to make 1,500 tons before June, 1948. Subsequently, if all goes well, they hope to turn out about 3,000 tons per year from one kiln.

Pests

(*a*) *Insect*—

Maize-stalk Borer.—This has been the major insect pest during 1947. It is hoped that measures taken to enforce the burning of maize-trash before 1st February, will help to reduce the infestation in 1948. Dressings of sodium fluosilicate, and D.D.T. are now regarded by the majority of farmers as routine precautions to be taken each season.

Green-fly—Aphis Species.—Some damage has been caused on wheat farms, particularly where soils are infertile. The total loss from this pest, however, would not amount to more than 500 acres of wheat throughout the district.

Locusts.—Nil.

(*b*) *Plant*—

Datura stramonium.—This weed continues to be a serious pest. Fines paid by Uasin Gishu farmers for Datura in wheat are as follows:—

1946: £704. .. 1947: £1,092.

The reason for the increase in 1947 is due to heavier penalties and not to a spread of the weed.

Total deliveries of grain containing Datura, from farmers in the district, were:—

1946: 69 consignments. .. 1947: 40 consignments.

The method of direct fines appears to be the only satisfactory one for dealing with this or any other poisonous weed in grain.

Darnel (*Lolium temulentum*).—There has been a rapid spread of this weed during recent years. The following figures obtained from Messrs. Unga, Ltd.. Eldoret, give an idea of the increase.

1945.—11,449 bags of wheat were degraded for containing ½ per cent or over of Darnel seed.

1946.—24,305 bags of wheat were degraded for containing ½ per cent or over of Darnel seed.

1947.—37.545 bags of wheat were degraded for containing ½ per cent or over of Darnel seed.

Probably the only satisfactory method of checking this pest will be to make substantial increases in the penalties.

Centaurea solstitialis (?).—This weed is becoming increasingly serious in all parts of the district. Its presence in a wheat field makes harvesting extremely difficult, owing to the prickly nature of the seed and its blocking effect on machinery. The weed grows up in a tangled mass together with wheat and is difficult to eradicate once it has gained a hold. It may be advisable to have this declared a noxious weed.

Farm Planning and Inspections

Much valuable work has been done by Mr. Huntingford, A.S.C.O. (Inspector). This has included a large series of court cases against both Africans and Europeans for infringment of rule 5 of the Land and Water Preservation Ordinance, 1943.

Fines for the year totalled £140; and it is interesting to note that this pays almost half the River Scouts' salaries.

Attention has also been given to farm planning. A preliminary survey is carried out by the Inspector, and the detailed plan worked out in conjunction with the Assistant Agricultural Officer. The method used is as follows:—

1. A rough survey of the whole farm is carried out by compass and pacing, showing:—

(*a*) All existing cultivation.

(*b*) All potential arable land.

(c) Permanent crops, i.e. wattle, etc.

(*d*) Existing roads and tracks.

(*e*) Drainage lines, streams, watercourses, etc.

(*f*) Land suitable for rough grazing—permanent pasture, forest swamps, escarpments, etc.

2. The total arable land is then sub-divided as necessary so that a balanced rotation between temporary ley grasses and cash crops may be worked.

3. Land use, and a rotation suitable for the area is then worked out for a period covering 10 to 12 years.

Many farmers, particularly new settlers. are anxious for help of this kind from the Department.

In general, 1947 has been a bad year for soil erosion, and great damage has been done even on land which is comparatively flat. The rate of erosion is still far in excess of the rate of terracing and improvement in farming practice.

Investigational

Experiment—Burning versus Ploughing-in of Crop Residues.—This experiment reported by the Senior Agricultural Officer, Kitale in his 1946 Annual Report, has given the following results:—

(i) Straw burnt, gave an average 390 lb. wheat per acre.

(ii) Straw ploughed under, gave an average of 270 lb. wheat per acre.

Pasture Trials.—Work during the year was carried out on two farms, one in the Lessos area and one in the Moiben area. The objects were as follows:—

(1) At Lessos.—(*a*) To try Rhodes Grass and Molasses Grass for temporary leys under those conditions; (*b*) to ascertain the most satisfactory method of covering seed after sowing.

With these objects in view, the following trials were carried out—three strips were marked out after the grass had been sown; one area treated with a light drag harrow only; one area treated with a rib roller only; one area treated by both harrowing and rolling. The treatments were duplicated.

The results showed that there is no visible difference between any of these methods of covering grass seed. All plots germinated well. It was found that under these conditions Molasses Grass was more satisfactory than Rhodes Grass; (i.e. at an altitude of about 7,500 ft.; rainfall 45 inches per year, and a somewhat heavy soil).

(2) At Moiben.—The object was to find whether seed of both Molasses and Rhodes Grass can be sown satisfactorily through a wheat drill at the same time as the planting of wheat. For this purpose the following methods were tested:—

(*a*) Grass seed mixed with a small quantity of fertilizer and sown through the grain box of the drill. No wheat was sown at the same time.

(*b*) Grass seed mixed with the wheat and sown through fertilizer attachment of the drill. No fertilizer used.

(*c*) Grass seed mixed with the wheat and sown through the grain box of the drill.

(*d*) Grass seed alone sown through the fertilizer attachment with wheat planted through the grain box as normal.

(*e*) Grass seed mixed with fertilizer and sown through the fertilizer attachment, with wheat drilled in through the grain box as normal.

At the time of sowing it was found that this last method (*e*), was the easiest and most practical.

Legume Trials.—In an endeavour to find indigenous legumes which may be suitable for sowing in mixture with temporary leys, seed of a number of varieties was collected early in the year. These were planted in June on a farm at Soy. The result showed that one type at least is promising, although the work was spoiled through the inability of the farmer to check heavy weed growth. This trial is to be repeated in 1948, when it is hoped that some more conclusive results may be obtained.

Stalk-borer Trials.—Trials to test control measures for maize-stalk borer, were set out on two farms in the Turbo area. Chemicals used were:—

Sodium fluosilicate—5 oz. mixed with 16 gallons of water. D.D.T. dust, one part mixed with Kensil F. (diatomite)—100 lb.

The results were as follows:—

Farm A.—100 plants taken from Control plot showed 56 per cent infestation of stalk borer;

100 plants taken from plot treated *twice* with sodium fluosilicate, showed 32 per cent infestation;

100 plants taken from plot treated *once* with D.D.T. showed 2 per cent infestation.

Farm B.—100 plants taken from the Control plot showed 1 per cent infestation;

100 plants taken from plot treated with D.D.T. showed 16 per cent infestation.

Note.—In each case the 100 plants were taken at random throughout the treated area.

Experimental Station

During the year, 500 acres on L.O. 780/5 were taken over from the European Settlement Board and set aside for development as an Experiment Station. Seventy acres of this have been taken by the Soil Conservation Service as a camp site, office and depot for machinery, etc.

The farm is four miles from Eldoret Township and is ideally situated for the purpose. The soil is, if anything, poorer than the average for the Plateau.

Conclusion

1947 has been a disappointing year for most farmers. Some progress has been made towards a change over to sounder farming methods, and it is becoming more generally realized that the future health of the soil depends on mixed farming with the introduction of live stock and temporary grass leys.

The fact that farming in this district is on a very unsound footing, is born out by the reliance of a large number of farmers on cash loans from the Production Board. Figures showing the number of farmers who have applied for advances over the last three years are as follows:—

In 1945 a total of £54,965 was advanced to 132 farmers. There were 499 units or farms in the district. Therefore, 26 per cent of farmers relied on loans.

In 1946 a total of £50,987 was advanced to 124 farmers. There were 472 units or farms in the district. Therefore, 26 per cent of farmers relied on loans.

In 1947 a total of £51,440 was advanced to 129 farmers. There were 477 units or farms in the district. Therefore, 27 per cent of farmers relied on loans.

These figures make it abundantly clear that if the Increased Production of Crops Ordinance is withdrawn, or if there is a drop in the prices of cereals, many farmers will find themselves in great difficulty. It is alarming to note, also, that many who rely entirely on cereals, appear to have little appreciation of their present dangerous position, and have no intention of starting mixed farming.

With regard to increased food production, the chief obstacles in this district to-day are:—

(*a*) the increasingly poor quality of the African labourer;

(*b*) the shortage of machinery with which to replace labour.

If tractors and machinery can be supplied in greater numbers there is no doubt that there can be a considerable increase in production through an increase in the acreage under crops.

L. R. N. STRANGE,
Assistant Agricultural Officer.

SOIL CONSERVATION SERVICE ANNUAL REPORT, 1947

Staff

European.—Mr. R. O. Barnes, Soil Conservation Engineer, returned from overseas leave on 23rd April, 1947.

Seven men who had been working in the Soil Conservation Service were posted to the Egerton School of Agriculture on 8th March, 1947, for the Agricultural Course. This number does not include men, termed Assistant Soil Conservation Officers on engagement, who had not been seen by the Soil Conservation Service.

Mrs. W. J. Cardwell, Assistant Soil Conservation Officer, Grade I (Botanist) (formerly Miss Frazer), was transferred to the Pasture Research Section at Kabete on 1st November, 1947.

Eighteen Assistant Soil Conservation Officers were engaged during the year. Of these eight were posted to European areas under the Soil Conservation Service, and ten to Native areas under the African Settlement and Land Utilization Board.

The following Assistant Soil Conservation Officers were in charge of Districts during the year:—

Trans Nzoia.—Mr. M. Kerfoot.
Uasin Gishu.—Mr. G. E. Goby.
Njoro.—Mr. C. F. Newton.
Lumbwa.—Mr. S. S. Brugh from 1-1-47 to 15-9-47.
Mr. G. H. Dukes from 15-9-47 to end of year.
Thomson's Falls.—Mr. N. G. Glynn.

The European staff position at the end of the year was as follows:—

Senior Soil Conservation Officer, 1; Soil Conservation Engineer, 1; Inspectors, 3; Assistant Soil Conservation Officers Grade I (European Areas), 17; Assistant Soil Conservation Officers Grade II (European Areas), 1; Mechanical Staff, 4; Clerical Staff, 2; Assistant Soil Conservation Officers Grade I (Native Areas), 28; Assistant Soil Conservation Officer Grade II (Native Areas), 1.

African.—During the year the following numbers were engaged and/or discharged:—

	Engaged	*Discharged*
Artisans—		
Mechanical	3	—
Carpenters	4	3
Masons	6	5
Others—		
Camp Boys	30	12
Clerks	2	3
Labourers	364	271
Levellers	18	9
Lorry Drivers	6	2
Nurserymen	2	1
Office Boys	1	—
Ox Drivers	1	2
River Scouts	10	7
Headmen	1	—
Staff Boys	2	8
Terracers	23	17
Tractor Drivers	9	12
Watchmen	1	1
Totals	484	356

The number of African staff employed at the end of the year was as follows:—

Carpenters	12
Masons	10
Mechanics	3
Clerks	6
Camp Boys	34
Instructors	7
Levellers	47
Lorry Drivers	16
Labourers	235
Nurserymen	2
Office Boys	2
Oxen Drivers	2
River Scouts	96
Staff Boys	38
Terracers	92
Tractor Drivers	20
Watchmen	7
Total	629

Visits

During the year several visits were made to each Soil Conservation District by the Senior Soil Conservation Officer and the Soil Conservation Engineer in connexion with Soil Conservation Service work and farm plans for soil conservation, as well as on dam construction and drainage.

On 11th April Mr. Maher flew to Nairobi and on the next day to Kongwa, near Mpwapwa in Tanganyika Territory, the temporary headquarters of the Ground Nuts Scheme. The next four days were devoted to discussing with officers of the Ground Nuts Scheme the most practical methods of clearing and cultivating the "rhino bush" land upon which the groundnuts are to be grown in this area. It was eventually agreed, following trials, that the bush, largely *Commiphora* spp., could be cleared by bulldozers and angledozers, left to dry and then burnt. The residue of the material ws to be placed in contour lines by means of brush rakes and angledozers. It was considered that the use of rooters to tear up the roots, followed by heavy discing with a Baronet or similar disc harrow, would render ploughing unnecessary in the first year. Plans were also agreed upon regarding the anti-erosion measures necessary in the early stages of the scheme.

Mr. Maher returned by air to Nairobi on Thursday, 17th April, and to Kitale on 19th April.

The Senior Soil Conservation Officer also visited the Grazing Schemes at Ndalat and Esageri in April.

Mr. Maher, Senior Soil Conservation Officer, lectured at the Egerton School of Agriculture, Njoro, in January, giving a series of twelve lectures to two classes on the agronomic, engineering and economic aspects of soil conservation, and again lectured in October. In November he assisted in setting the examination papers for the School, and in December he was one of the Board of Examiners to assist in marking the papers

Mr. C. F. Newton, Assistant Soil Conservation Officer i/c Nakuru District, visited Moyale, N.F.D., by air on 16th November and spent a week examining and reporting on erosion in and around the Moyale township. He made recommendations for the control of erosion.

Mr. Maher, Senior Soil Conservation Officer, attended the East African Agricultural Conference on 29th and 30th July and the Senior Agricultural Officers' Conference on 11th and 12th August.

Visitors

Col. Evans, Consulting Engineer to the Development and Reconstruction Authority, visited soil conservation work and dams in the Trans Nzoia and Uasin Gishu districts during February.

Mr. D. L. Blunt, Director of Agriculture, accompanied by Dr. Bernard Keen and later by Dr. Worthington, visited farms in the Nakuru, Uasin Gishu and Trans Nzoia areas seeing farms with soil conservation measures.

Dr. Curzon of the Native Affairs Department and Dr. du Toit of the Department of Agriculture, Union of South Africa, visited soil conservation work in Nakuru and Kitale districts. The guests from the Union said they were very impressed with the amount and quality of the work carried out in the Colony.

Miscellaneous Work

The attached tables Nos. III and IV summarize the work done in European areas during the year.

There was a small increase in the amount of anti-erosion work done by the Soil Conservation Service during the year, but, as always, progress is retarded by the lack of sufficient tractors and implements. The work of providing housing, offices and stores for Soil Conservation Service District Headquarters went forward steadily throughout the year although the question of the General Headquarters and the Nakuru and Nairobi District Headquarters remained unsettled at the end of the year.

It cannot be said that the agricultural scene is an encouraging picture despite the favourable prices which have been enjoyed by farmers during the past few years. Continued heavy erosion is evident in many parts of the European areas and the yields on a considerable portion of farms are not economic whatever the price of maize and wheat is likely to be during the next few years. It is plain that many of the new settlers will have great difficulty in keeping their heads above water on farms which were left in poor condition after the last slump in the early thirties.

Encouraging signs, however, are the increasing appreciation of farmers of the need for better farming and protection against erosion, while an increasing number of farmers request assistance in planning their farms fully on the lines of conservation farming under a good agronomic system reinforced by such anti-erosion works as may be necessary.

This advisory and planning work constitutes a heavy call upon Soil Conservation Service staff in the European areas and the number of staff originally visualized is not sufficient to proceed with this work as fast as is desirable.

The Soil Conservation Service has come to have less and less to do with work in the Native Reserves. It must be said, however, that it is thought by a few of the Senior Officers of this Service that no expenditure in the Reserves can have any useful or lasting result which is not based on the fundamental concept of the necessity for land use planning within the Reserves, having regard to topographical conditions, soil and climatic types and modern agricultural methods.

At the same time sociological chaos must ensue if changes are not effected in land tenure systems and if any rearrangement of land use does not have in mind economic and land tenure changes *made with the consent and co-operation of the people* which have the object of obtaining certain minimum standards of life for African families in whatever occupation.

Machinery

At Kitale the old pre-war K.A.R. Supply and Transport Workshops have been used for repairs and overhauls to Soil Conservation Service plant. Difficulties were experienced at Njoro over the lack of workshops. A temporary workshop was bulit from wattle poles and old bitumen drums. Heavy repairs and overhauls were dealt with during the year both at Kitale and at Njoro, and in the field at Thomson's Falls. There were several stoppages of terracers due to the fracture of the beam which carries the mouldboard. This trouble has been overcome by welding a piece of rail to the back of the turning circle and welding in two braces.

While the Dam Construction Unit was working in the Trans Nzoia and Uasin Gishu areas the Mechanical Plant Superintendent from Kitale visited the unit each Saturday. While the unit has been in the Thomson's Falls area the Assistant Soil Conservation Officer (Mechanical) of the Dam Construction Unit has carried out repairs and overhauls.

Representatives of the Caterpillar Company visited the Dam Construction Unit in March. They also demonstrated a No. 212 motor grader on terracing work, but it was found to be too light for the heavy conditions in the Trans Nzoia.

The following additions were made to the machinery of the Soil Conservation Service during the year:—

Cletrac DD Diesel Tractor.

D.6 Caterpillar Tractor.

International T.D. 14 Tractor.

International Farmall "M" Tractor.

D.4 Caterpillar Tractor.

Sheepsfoot Tamping Roller.

La Plante Choate Hydraulic Angledozing Equipment was fitted to the Caterpillar D.6 Tractor.

Vehicles

A Dodge 3-ton lorry (O.H.M.S. 2121) was added to the vehicles at the disposal of the Soil Conservation Service during the year. This is earmarked for the proposed Nairobi District Headquarters.

Water Supplies

The Dam Construction Unit completed six dams in the Uasin Gishu District and was loaded on rail at Eldoret on 26th March, arriving at Thomson's Falls on 7th April. The size of the plant is over gauge for the Kenya and Uganda Railways and Harbours and requires special arrangements for traffic when being moved by rail.

Sixteen dams were completed in the Thomson's Falls District during the year.

Excellent work was done by all the Dam Construction Unit staff in both areas and by the Assistant Soil Conservation Officers and their staffs on dam surveys. Letters of appreciation were received from farmers.

The efficient maintenance, repair and overhaul of the heavy plant is essential to keep plant working continuously and the mechanical staff put in long hours and efficient work. The first full year's work has shown how essential it is to have efficient mechanical staff with Dam Construction Units.

The few applications for dams grew rapidly as the public gained confidence in the work of the Dam Construction Unit and saw the rapidity with which earth dams were constructed. At the end of the year there was a long waiting list of applicants for dams in many districts.

With few exceptions the farmers for whom the dams were being built gave full and willing co-operation in supplying labour for core digging and supplying other services to the unit. In some cases the cores were dug by the Soil Conservation Service labour gangs as the farmers had no labour available, or not sufficient.

During the first part of the year the plant was new and required few repairs and spares, but later in the year the heavy wear on dam construction put up the cost of repairs and spares. It is likely that the charges to farmers will have to be raised to cover the cost of working in future as well as the depreciation of plant. This increased cost of repairs and spares offsets the reduced working time that has resulted with the gain of experience in operating the plant. Track wear was considerable and there was some delay in obtaining spares from the agents. In future spare tracks will be kept on the job for use while others are being reconditioned. At the rate charged per hour the cost per cubic yard to farmers varied from the cheapest at 29 cents to Sh. 1/28 per cubic yard for a water hole.

The training of African drivers for the work presents problems. Early in the year out of twenty tried out for training only two showed the necessary willingness, skill and attention to instructions to be made Class II drivers.

The lack of runoff and rainfall intensity data in the Colony is a serious problem in dam design. The year's work has shown how essential it is that Government should provide funds and staff over a long period of years to obtain run-off data for different types of catchments and districts throughout Kenya. An instance of high run-off in a well-grassed area where it might not have been expected was where a dam with 200 acres of catchment and a capacity of 41 acre feet was filled by a single storm within a few hours of completion. These high intensity storms over small areas are the danger in both farm dams and soil conservation work.

The attached tables I and II give details of the dams completed during the year.

The spillways of farm dams present difficulties where there is not a natural rock outlet for dams with larger catchments, as farmers are not in a position to afford the cost of masonry or reinforced concrete spillways to deal with flood flows. In some cases sites could not be used because of the cost of the spillway. Where grassed spillways have to be used, trickle tubes have been provided to deal with normal stream flows and the dams are on small catchments.

The full year's experience has shown that in future, especially if more Dam Construction Units are employed, it will be essential to have additional staff for surveys and design of dams on farms, and investigational work. Dam construction in an area throws too much additional work on the Assistant Soil Conservation Officer and his staff, though they can probably fit in preliminary inspection of dam sites when applied for in their areas. Field staff as well as office staff are required.

Terracing

The attached tables show the amount of terracing carried out during the year. During the first quarter there was an increase in the amount of hand work done.

Breakdowns, despite efficient maintenance, held up work during the second and third quarters. These breakdowns occurred with old plant; in areas with comparatively new plant there was freedom from breakdowns.

All districts could employ more plant to cope with the acreages requiring terraces, cut-off drains and other work. With more plant more staff will be required for the proper design of soil conservation work, and lay-outs which will give a workable farm plan with roads, cut off drains, grassed outlet channels and terrace systems all fitted in to suit the contour of the land. On the protective system formed by soil conservation works, which help to control run-off water, farming practices designed to maintain and build up the soil fertility can be more safely applied.

It has been found that in some of the more fertile areas weed growth is very rank and cannot be kept down by cultivation. In these cases the rate of flow from terrace channels is very slow and in future steeper grades will be tried out to carry the water away more quickly. With steeper grades, however, there is always the danger of erosion early in the season before the weeds come up.

A similar problem occurs in heavy clay areas which are already eroded, forming gullies in which water ponds and does not get away easily. These eroded clay fields that are subject to waterlogging in wet seasons may have to be closed to cultivation unless a method can be found of cultivating that will allow protection from erosion combined with sub-surface drainage. Various methods will be tried out as opportunity occurs. Where there are already hollows in the field, it is not possible to put a steep enough grade on the terrace channels to drain the surface water from the hollows, without the terrace channels themselves eroding. It is possible that the real use for such fields, which are often fertile unless they have been cropped too long, is as pasture. In most cases the pasture will require sub-surface drainage, but this will be simpler than drainage where cultivation is carried out, but the economics will have to be considered.

Maintenance of terrace systems and drainage outlets is still a problem. There are farmers who maintain their terraces in excellent condition and plough in the correct way each year. Others have the greatest difficulty in carrying out good maintenance. Constant personal supervision and good farm implements in adjustment are required to obtain good results.

It is hoped to produce a bulletin on ploughing and maintenance of terraces with photographs taken in Kenya.

In some areas to make ploughing easier the terrace interval has been widened and a grass strip has been left above the terrace channel and bank, which are left under grass unploughed. This system is still in the experimental stage as regards working by farmers. It has already been noticed that in many cases the grass strips are not left at their original width and that they get ploughed into and are then too narrow to be of use, and the whole system breaks down. As in all farming operations it is the personal supervision of the farmer that counts. Where grass is used to reduce the number of terraces and to make ploughing and cultivation easier, the farmer must see that the grass is left at the proper width.

Roads

Farm roads which were surveyed in connexion with farm soil conservation plans were constructed during the year. The number of yards of road is shown in the table of work done.

Drainage

Inquiries for advice and requests for drainage work to be carried out on waterlogged lands are constantly received from all areas.

A memorandum on the necessity of sub-surface drainage was submitted to the Hon. Director of Agriculture in August 1947. A second memorandum on legislation requirements allowing for easements in the matter of main drainage ditches, etc., to carry water from higher farms through the main drainage lines on lower farms to rivers and streams was submitted in October. Estimates were prepared for machinery required for a drainage unit.

Two small areas, one at Thomson's Falls and the other on the North Kinangop, were prepared for experimental mole drainage. The open drains were dug ready for moling. The mole drainage ploughs available in the country would not work deep enough for the soil condition usually found in this country's wet areas. A mole plough capable of working to 30 inches deep is on order.

Excellent drainage tiles are made in Kenya on the Kinangop and at the Public Works Department's tile works in Nairobi. These pipes are up to English standards but the cost is round about 25 cents each for a 4-inch pipe as compared to about 15 cents delivered on the field in most parts of England where drainage is carried out. It is understood that commercial firms are so full of orders for roofing tiles, which pay better than making and burning agricultural pipes, that they cannot undertake pipe making. Agricultural drainage pipes would have to be made on a very large scale to bring down the price.

Erodible black clay land in the Fort Ternan–Songhor areas presents a difficult problem where the land requires drainage, but still requires protection from erosion as many fields in this type of soil are heavily eroded and are at the stage when they should be closed to further cultivation.

Experimental work on drainage in various types of soil in all districts will be required in the future to find out economic methods of drainage land, both for cultivation of crops and pasture.

Surveys

Surveys of farms for lay-outs of fields and farm roads were made in all districts where terracing has been carried out to enable farm rotation plans to be properly fitted into the protective framework provided by mechanical soil conservation measures. Among the larger surveys made for land planning were farms of 1,200 acres and 1,660 acres in the Trans Nzoia, of 3,000 and 880 acres in the Thomson's Falls area, of 3,000 acres in the Nakuru District and of 450 acres in the Aberdares, as well as many smaller areas.

With the increased demand in all districts by farmers to have a soil conservation lay-out and farming policy drawn up for their farms this part of the Soil Conservation Service's work, done in co-operation with District Agricultural Officers, will increase rapidly.

Inspection Service

Soil Conservation Inspectors under the Land and Water Preservation Ordinance are directly responsible to the Agricultural Officers of their districts for inspections and orders issued under the Land and Water Preservation Ordinance. Owing to changes during the year and shortage of Agricultural Officers, extra duties in connexion with inspection work have had to be carried out by Assistant Soil Conservation Officers.

Trans Nzoia.—An Inspector was fully employed in this area throughout the year. Many maize fields have been closed to further cultivation, owing to their eroded and poor condition. In the second quarter alone, 2,300 acres of maize land

had to be closed to further cultivation and are to be put down to grass. The shortage of good pasture grass seed holds up the re-grassing of such areas which should not be allowed to revert to self-sown poor type grasses.

The Inspector reports that considerable erosion damage has been done in the past as a result of cultivation being carried out in the absence of the necessary protective ditches above the fields. In some cases the cultivation had been carried out on the orders of the Production Board to obtain increased crops.

Another factor reported as contributing to increased erosion and loss of fertility and soil deterioration has been the renting of farms without any clauses to ensure that the lessee gives proper protection and maintenance to the land. This is particularly the case where the leases are short term. Some ex-enemy farms leased on yearly leases are severely eroded. A case was reported where the reported maize yield is down to four bags an acre on good mountain soil where similar land properly farmed and protected gives twenty bags an acre.

The control of squatter cultivation on stream banks is reported satisfactory on the plains area of the district, but not so satisfactory in the mountain area. The employment of squatter labour in the mountain areas entails special dangers owing to the absence of land for squatters other than that on excessively steep slopes. Land has been cleared on mountain farms by squatters on 39 per cent slopes and in some cases farmers themselves are cultivating 24 per cent slopes without erosion protection. These steep slopes can only be safely cultivated if bench terraced with cut off drains above. Mountain slopes of up to 18 per cent have been successfully worked with "V" type bank terraces, but in these cases they are only successful if maintained by farmers who give constant personal supervision to the work of their ploughs and labour as maintenance of the banks on steep slopes is very difficult.

Uasin Gishu.—An Inspector was employed in this area throughout the year. Farms were inspected in the following areas: Kipkabus, Burnt Forest, Ainabkoi, Lessos and Plateau, and a start was made in the Moiben, Turbo, Hoey's Bridge and Soy areas.

A large acreage is reported as having been cropped for long periods without rest, rotation or soil conservation measures to protect the land from erosion and maintain fertility. A case is reported of a field near Lessos which had been cropped continuously for 25 years; the field was one of 20 acres and had 25 separate gullies some of which were 3 feet deep.

In some of the higher areas with volcanic soil the soil is more absorbant, but even here mechanical protection is needed to control erosion in addition to suitable crop rotations. Erosion can be seen in unprotected fields. The Inspector reports that he has seen cases of progress in the Kipkabus and Lessos areas where some farmers are using portable milking bails and the planting of oats as a temporary pasture which is grazed off with a heavy concentration of stock, to improve soil fertility.

Logging at saw mills is the cause of considerable erosion and orders had to be issued to one saw mill in the Timboroa area to control the dozens of badly eroded logging tracks that have scarred the bare grass slopes.

The Inspector reports that there was considerable discussion at a meeting of the Southern Uasin Gishu Farmers' Association regarding the legal limitation of two acres of cultivation for resident labourers on European farms, even if the land is prepared for tree planting, as compared with the unlimited area of cultivation which it is alleged is allowed to Forest Department squatters. The control of squatter cultivation by the owners of farms is a major problem; in one case a new purchaser of a farm complained of the amount of African cultivation

of steep slopes of 25 to 30 per cent on the farm, and this was investigated; it was found that in the case of one casual labourer who should have been limited to half an acre of cultivation, this labourer was working nine acres.

In the Moiben District a large area is reported as cultivated by squatters right across the catchments of small streams on steep slopes which were once forest; orders will be issued for the control of this area.

"Share cropping" is another cause of serious land deterioration. The Inspector reports that a great deal of good land in the district is being ruined by "share croppers" and it is proposed to place restrictions on the operations of these temporary occupiers.

The Inspector remarks that much closer co-operation is required between the European Settlement Board, the Department of Agriculture generally and the Soil Conservation Service of the Department of Agriculture in the interests of the land and the economic future of new settlers: a number of cases have been seen where new tenant farmers under the European Settlement Board seem to have no constructive plan of farm development and are farming on exploitive methods rather characteristic of the old pioneer days. The necessity of land use planning with farm programmes planned at least five years ahead has been stressed in the Soil Conservation Service quarterly reports for the past few years.

In the Bessie Fontein area some farmers have had to choose between terracing or closing down. The Inspector reports "The soil was originally very fertile and erosion has been appalling, and the streams run thick with mud every time it rains, with the result that dams some miles down stream are in danger of silting up". Three farmers in this area have asked to have their farms planned and to have farming policies worked out for them. This is being done by the Assistant Agricultural Officer, Eldoret, in co-operation with the Soil Conservation Service of the Department of Agriculture.

Nakuru.—This area was without an Inspector for most of the period up to September, when an Inspector was posted. He commenced inspection in the Subukia–Solai areas, investigating the question of squatter cultivation. Orders have been issued for the closing of large areas of steep cultivation and their return to grass cover. The Inspector reports that the majority of the farmers in these areas are soil conservation minded and that the farms on which steep cultivation is still in evidence are viewed with disfavour in the neighbourhood.

The main areas with large stretches of squatter cultivation on very steep land are Subukia, Dundori and Turi. It is hoped that within a year most of these steep slopes will have been restored to grass.

The Inspector stresses that too many farmers do not control their squatters satisfactorily. When the question of control is discussed with farmers they agree readily and entirely, but nothing further is done unless pressure is brought to bear.

Unless farmers act more or less voluntarily in co-operation with the Inspector there would be perpetual friction and the best results could not be obtained. It is proposed to refer this matter to Farmers' Associations in the areas which are chiefly affected and to ask for co-operation of individual farmers. It has been found increasingly difficult, says the Inspector, "to impress on farmers the fact that an order is served on the farm and not on the farmer, and that no personalities are intended". Many farmers do not seem to appreciate that the regulations of the Land and Water Preservation Ordinance cannot be enforced against squatters unless orders have been served.

A preliminary inspection indicated that there was room for improvement along river banks in the Rongai and Eldama Ravine districts, and attention will be given in the near future by River Scouts to these districts.

Nyanza.—It has not been possible to post an Inspector to this area. The Assistant Soil Conservation Officer in charge, Lumbwa, has carried out some inspection work when his other duties have allowed.

Thomson's Falls.—There has been no Inspector in the main area covered by this district. The Assistant Soil Conservation Officer in charge, and his staff have carried out inspection work where possible. A large area of wheat land requires control for erosion; as it was not possible to issue orders regarding these areas verbal agreements were made with farmers that they would put certain land out of cultivation and would take the protective measures required in the case of other fields. It remains to be seen how these verbal agreements will work. In some cases it has unfortunately been shown that to get anything done an order has to be served under the Land and Water Preservation Ordinance, whereas in others the agreement has been honoured.

North Nyeri.—This area is under Thomson's Falls and had an Inspector up to December when Mr. Ruck resigned after good work in difficult circumstances.

The Inspector reports that early in March torrential rain fell in the drought stricken area between Uaso Nyiro and Ngobit Rivers, causing terrific run-off and wash.

In the Timau District where farms were carrying too much stock the land is growing almost exclusively poor annual grasses such as *Chloris pycnothrix* and *Aristida* spp.

In the country north of Nanyuki and the Loldaiga Hills inspections were made during January by the Inspector and the Agricultural Officer, Rumuruti. In general conditions are described as disastrous in places where the deterioration of grassland had gone too far to permit of recuperation by resting. There were native stock 10 miles inside the European boundaries. The situation has been described by Mr. Ruck to the Director of Agriculture, to the Land Board and to the European Settlement Board. As Mr. T. Y. Watson has urged for years, the question can only be dealt with by regrouping farms to give economic units and alienating Government land to present a barrier against trespass and prevent overstocking. It is now considered that 70,000 to 75,000 acres are needed to ranch 1,000 head of cattle in this area, allowing for no trespass. It was hoped to revive the farm regrouping committee of the Nanyuki Farmers' Association. In his September report the Inspector is critical of the complete lack of liaison between various departments who should be concerned with control of land in dry ranching areas. In the lower semi-arid areas of the Uaso Nyiro– Mukigog–Engaro Ndare the grazing position was still difficult in September despite the exceptionally heavy rains that have occurred since January. No progress has been made regarding the regrouping of farms that has been urged by departmental officers in the district for many years. Several properties have come on to the market which should have been used to enlarge neighbouring ranching units in order to make economicalized areas.

In some areas as a result of exceptionally heavy rains the recovery of grass has been remarkable, but the fundamental principle of good stock management must be accepted, that is "that the rate of stocking should accord with the grazing available in a medium or poor year for grass". If the number of stock kept is sufficient to make full use of the grass in a good year of rainfall, the area will be grossly overstocked when the season is bad.

Surplus fodder in the good seasons should be stored as hay or silage to carry through the dry months and bad seasons. Possibly owing to machinery difficulties, very little hay is seen stored in this area.

In parts of the area with better rainfall, more fencing could be used as materials become available for fencing and piping for water supplies; this will enable pastures to be controlled efficiently.

The Inspection draws attention to the question of sub-economic farms of 5,000 acres or less which are surveyed in long narrow strips one mile wide and five miles or so long, with the only water supply a river at one end. He points out that it is difficult to justify economically the putting down of boreholes costing £1,000 on one of these strips, which are only considered to be worth about Sh. 10 an acre and on which the carrying capacity is still only 20 acres to the beast. When such farms come on to the market, if they are not regrouped new owners may be disappointed at the living they will give.

Good progress was made in the policy started in 1944 of gradually getting squatter cultivation off the steep areas except where trees were being planted, and in the Aberdares area where pyrethrum has been planted. The Forest Department were unable to fulfil all the orders received for trees to replant these steep areas and some areas will have to be planted next season.

The Inspector's report draws attention to the large areas of wheat land requiring attention to protect them from erosion in the wheat growing areas of the Thomson's Falls and adjacent districts, where large areas are in some cases worked with too little machinery. Wheat in eroding areas is only produced at the expense of the land.

Refresher Course

A refresher course was held at Kitale for six weeks in July and August. It was attended by 9 Assistant Soil Conservation Officers and 26 Levellers.

A series of lectures was given by Mrs. Cardwell (Assistant Soil Conservation Officer/Botanist) on land classification from the botanical aspect, also on elementary botany with particular reference to *Graminea.* Lectures were supplemented by field work in which officers were taught to identify weeds in arable land, grasses and various trees and shrubs, including vegetation which is indicative of low or high soil fertility, soil acidity, etc.

Instruction was also given in the field by Messrs. Maher and Barnes on the development of farm plans and actual plans were prepared for three farms. Several tours were made of future terracing schemes.

Soil Conservation Service Farm Land, Kitale

The plan for the Soil Conservation Service Farm Land was developed to give rotations with grass leys. A molasses grass ley was put down, one of *Eragrostis curvula* planted from splits, and one of *Panicum coloratum var. makarikariensis.* The latter is doing well.

Fencing is being carried out on the contour and all the land is terraced.

The maize crop was patchy, due to excessive rain during the season. Thefts of maize from the field were considerable.

Bush Clearing—African Areas

Mr. Darvall, Assistant Soil Conservation Officer (Mechanical) designed a bush clearing machine for use on the Esageri Land Scheme. The machine was made up by the K.U.R. & H. workshops. During the wet period the D.6 tractor with the hydraulic La Plante Choate angledozer was brought from Thomson's Falls to carry out an experiment in bush clearing at Esageri. According to a report by Mr. Darvall, it was found possible to clear approximately an acre an hour with the angledozer and it is considered that 75 per cent to 80 per cent clearing was made. A grubber which was made by Messrs. Harrtz and Bell, Ltd. of Nairobi, to a design by Mr. Darvall was tried out at the same time. This machine proved quite successful on land which had been previously cleared of aerial growth, but it was impossible to use it at the back of a tractor immediately behind the angledozer owing to the branches and brush left on the ground by

the angledozer causing the machinery to choke. Mr. Darvall suggested that the following procedure should be adopted: first of all a D.6 or similar size crawler tractor, fitted preferably with hydraulic equipment, should bulldoze the heavier growth and most of the small growth. After this the tractor should be fitted with a brush rake and the branches pushed into windrows. The windrows could then be left for a year, when it would be possible to decide whether it is necessary to use the grubber or whether it would be more economical to remove any re-growth by hand.

Schemes in Native Reserves

Ndalat Grazing Scheme, Nandi.

Esageri Land Scheme, Kamasia.

Solai Border Grazing Scheme.

Olenguruone Kikuyu Settlement, Molo.

Fort Hall.

Kiambu.

As pointed out at the beginning of this report, the Soil Conservation Service has had less and less to do with the Native Area Schemes. These have been reported on in detail in the Quarterly Reports and the annual reports will have been dealt with by the authorities particularly concerned.

Camps and Buildings

Kitale.—The new workshop, septic tank and petrol store were completed, also the office lavatories.

Two two-roomed timber houses, each of approximately 40 sq. ft., were almost finished at the end of the year. Two Type 2 and and two Type 4 African quarters and two Type 1 houses for African staff were completed by the Public Works Department and their contractors.

Three temporary maize cribs were built at the Soil Conservation Service Camp.

A Dispensary is being built at the Soil Conservation Service Camp, but was not quite completed by the end of the year.

Nakuru: (*Njoro*).—A wooden sectional house was built at Kitale and sent by rail to Njoro to house the Assistant Soil Conservation Officer (Mechanical).

More temporary mud and wattle houses were built in the Soil Conservation Service Camp.

No decision has been reached regarding the new District Headquarters. One hundred and fifty-four acres of land are under option next to Nakuru. Water is the difficulty.

Eldoret.—Eight temporary huts were built at the Eldoret Soil Conservation Service Camp.

The Public Works Department commenced the construction of a Mitchell Economy House.

Lumbwa.—A start has been made on 15 temporary buildings for African housing, and three were completed.

No further work has been carried out on the Mitchell Economy House being built by the Public Works Department since November. Work is continuing on the permanent African quarters.

Two temporary buildings of 15 ft. by 15 ft. and 30 ft. by 15 ft. with a kitchen 16 ft. by 8 ft. were erected.

Thomson's Falls.—The Public Works Department contractor completed two permanent African houses for Soil Conservation staff and a temporary house was built for the Assistant Soil Conservation Officer in charge. This house is now being occupied by a married man with a family, as well as by the Assistant Soil Conservation Officer in charge, owing to lack of accommodation.

New General Headquarters

No decision was made regarding the new General Headquarters for the Soil Conservation Service. This matter has been dragging on for some years.

Nairobi District Headquarters

No finality has been arrived at with regard to this site. The site near Thika was not agreed on, and a proposal to share land with the Medical and Prison Departments at Kamiti Downs fell through.

Housing

The housing situation has been difficult in all areas and is causing great inconvenience to many of the European staff. Unless decisions are made regarding General and Nakuru District Headquarters the position will be even more difficult in 1948.

Botanical

Mrs. Cardwell, Assistant Soil Conservation Officer/Botanist (formerly Miss Frazer) paid visits of investigational and advisory natures to farms in the Trans Nzoia, to the West Suk pasture areas and to North Nyeri and Naro Moru.

Plots of indigenous grasses were planted at the Soil Conservation Service Camp, Kitale, for experimental purposes with a view to future grazing trials. Seed of various exotic grasses was sent to Kisumu, Kilifi, Kapenguria, Lamuria, Machakos and Rumuruti for trial under different conditions.

Leys of *Melinis minutiflora, Panicum coloratum var. makarikariensis* and *Eragrostis curvula* were planted at Kitale.

The collection of seed from the experimental plots of exotic and indigenous grasses at Kitale continued.

A bulking plot of *Paspalum notatum* was planted at Kitale, in order to make this grass available to farmers for planting on bench terraces, etc.

Mrs. Cardwell has been compiling a Herbarium of various grasses during the year.

R. O. BARNES,
Acting Senior Soil Conservation Officer.

TABLE NO. I—DAMS CONSTRUCTED BY SOIL CONSERVATION SERVICE, 1947

Serial No.	OWNER AND DISTRICT	Waste Spoil from Spillway and Entrance	Fill in Wall	Fill in Spillway and Bank	Total Earth Moved
		Cub. Yds.	*Cub. Yds.*	*Cub. Yds.*	*Cub. Yds.*
47/1	J. Few, Moiben	970	9,800	—	10,770
47/2	J. Breckenridge, Moiben ..	6,600	11,250	7,500	23,350
47/3	P. Smith, Moiben	3,460	2,750	—	6,210
47/4	Ziwa, Ltd., Hoey's Bridge ..	16,500	13,590	—	30,090
47/5	F. Humphris, Kitale ..	—	3,690	—	3,690
47/6	R. Nestor, Upper Kipkarren	650	7,670	—	8,320
47/7	E. H. G. Augeraud, Thomson's Falls	—	16,349	1,600	17,949
47/8	E. H. G. Augeraud, Thomson's Falls	—	17,018	2,711	19,729
47/9	E. H. G. Augeraud, Thomson's Falls	529	9,151	815	10,558
47/10	E. H. G. Augeraud, Thomson's Falls	400	3,121	100	3,621
47/11	E. H. G. Augeraud, Thomson's Falls	—	5,000	200	5,200
47/12	W. van Blerk, Thomson's Falls	1,193	13,004	1,192	15,389
47/13	E. H. G. Augeraud, Thomson's Falls	—	8,127	2,422	10,549
47/14	J. J. Joubert, Thomson's Falls	—	12,412	533	12,945
47/15	Mrs. R. F. Carnegie, Ngobit	—	16,915	400	19,045
47/16	Miss J. Eyre Matcham, Ngobit	3,500	19,200	640	24,260
47/17	Capt. D. Sharpe, Ngobit ..	—	12,085	400	14,877
47/18	Capt. D. Sharpe, Ngobit ..	—	7,995	120	8,331
47/19	K. Cunningham, Marmanet	—	7,873	80	7,953
47/20	H. Trent, Marmanet ..	—	37,783	60	3,843
47/21	N. Montague, Marmanet ..	240	3,786	100	4,226
47/22	Ropley, Ltd., Thomson's Falls	3,210	13,192	1,700	18,102

TABLE NO. II—DAMS CONSTRUCTED BY SOIL CONSERVATION SERVICE, 1947

Serial No.	OWNER AND DISTRICT	Capacity	Catchment Area	Spillway Capacity	Purpose
		Acre feet	*Acres*	*Cu. Secs.*	
47/1	J. Few, Moiben	12	330	600	Domestic and stock
47/2	J. Breckenridge, Moiben	84	5,000	2,000	
47/3	P. Smith, Moiben ..	3	212	424	Stock
47/4	Ziwa, Ltd., Hoey's Bridge	208	5,000	2,500*	Sisal factory. *One 1,500 and one 1,000 cap.
47/5	F. Humphris, Kitale ..	3	350	700	Domestic and stock.
47/6	R. Nestor, Up. Kipkarren	22	650	600	
47/7	E. H. G. Augeraud, Thomson's Falls	64·16	330	500	
47/8	E. H. G. Augeraud, Thomson's Falls	78·16	401	600	
47/9	E. H. G. Augeraud, Thomson's Falls	32·24	128	250	
47/10	E. H. G. Augeraud, Thomson's Falls	7·9	Waterhole, not taken	Natural	
47/11	E. H. G. Augeraud, Thomson's Falls	11·02	150	250	
47/12	W. van Blerk, Thomson's Falls	40·99	250	400	Stock
47/13	E. H. G. Augeraud, Thomson's Falls	44·1	500	600	
47/14	J. J. Joubert, Thomson's Falls	45	350	500	
47/15	Mrs. R. F. Carnegie, Ngobit	51	800	450	
47/16	Miss J. Eyre Matcham, Ngobit	54	4,600	2,000	
47/17	Capt. D. Sharpe, Ngobit	46	150	240	
47/18	Capt. D. Sharpe, Ngobit	24	400	400	
47/19	K. Cunnungham, Marmanet	77	4	600	Stock and irrigation
47/20	H. Trent, Marmanet ..	15	4	600	Stock
47/21	N. Montague, Marmanet	18	4	600	Stock—water supply
47/22	Ropley, Ltd., Thomson's Falls	36	7	2,000	Stock and irrigation

TABLE No. III—MISCELLANEOUS WORK, 1947

District	Quarter	Hand-work cubic ft. Excavated	Length of Outlet Drains Constructed		Length of Cut-off Drains Constructed		Length of Roads Con-structed	Acreage Bench Terraced	Miscellaneous
			Yards	*Cu. Secs.*	*Yards*	*Cu. Secs.*	*Yards*	*Acres*	
Nakuru ..	1st.	158,440	2,286	860	5,841	1,674	12,477	—	3,448 yards training bank
	2nd.	28,386	2,131	529	3,566	596	6,393	—	2,498 yards training bank
	3rd.	—	—	—	—	—	—	—	
	4th.	12,124	333	75	2,270	343	12,496	—	5,454 yards training bank. 100 acres strip cropping and 1,235 acres contour planting marked
Uasin Gishu ..	1st.	29,326	1,165	384	2,760	604	1,835	—	
	2nd.	215,156	2,710	142	7,325	415	4,216	—	
	3rd.	36,964	—	—	—	—	—	—	670 acres set out for strips,
	4th.	16,490	2,612	510	6,050	1,433	6,770	4·7	etc.
Trans Nzoia ..	1st.	203,474	868	299	467	666	7,605	—	
	2nd.	197,271	2,684	292	14,459	1,028	8,507	—	38 acres set out for terracing
	3rd.	38,613	1,367	136	403	106	1,616	—	
	4th.	124,604	333	75	3,917	730	3,900	—	6,544 yards road repaired. 90 acres set out for grass strips.
Thomson's Falls	1st.	118,244	2,130	286	1,000	167	2,200	—	
	2nd.	131,667	3,900	282	3,597	300	5,226	3	
	3rd.	—	—	—	—	—	3,960	—	Plus 1 1/5 miles for P.W.D.
	4th.	31,195	—	—	—	—	3,463	—	1,610 acres survey
Nyanza ..	1st.	120,465	1,630	782	2,120	1,449	—	—	43,000 sq. ft. grassed outlets
	2nd.	—	—	—	—	—	—	—	
	3rd.	—	—	—	—	—	—	—	No other figures available.
	4th.	—	—	—	—	—	5,280 widened and graded	—	Tractor out of action.

TABLE No. IV.—TERRACING

DISTRICT	BROAD BASE TERRACING			S.C.S. TRACTORS		NARROW BASE TERRACES			BENCH TERRACES
	Acres	*Miles*	*Farms*	*Acres*	*Miles*	*Acres*	*Miles*	*Farms*	*Acres*
Nakuru	2,650·6	220·60	29	1,672·5	139·30	318·3	56·0	10	4·00
Uasin Gishu	1,597·4	156·72	20	747·0	74·91	2·8	0·5	1	8·01
Nyanza	69·5	9·8	3	69·5	9·8	—	—	—	—
Trans Nzoia	1,880·8	204·99	31	1,420·1	158·93	—	—	—	—
Thomson' Falls ..	1,288·7	166·76	12	1,288·7	166·76	—	—	—	3·00
TOTAL ..	7,487·0	758·87	95	5,197·8	549·70	321·1	56·5	11	15·01

The following work was carried out in addition during the year:—

TRANS NZOIA.—699 acres were set out for future terracing. Contour furrows were made on 120 acres of grassland. 6·43 miles of terraces, covering 85 acres, were renovated. 6,544 yards of farm road were regraded and grass strips were set out on 90 acres of land. Contour furrows were constructed on 438 acres of pasture land.

THOMSON'S FALLS.—Terraces with a horizontal interval of 20 feet and a grade of 1:300 were set out and constructed on 45 acres for irrigation of fruit.

UASIN GISHU.—Twenty-five acres of squatter shambas on one farm were pegged out for narrow base terracing and 404 acres of land were set out for contour planting of wattle. In addition contour grass strips were laid out on 487 acres and guide lines provided for contour ploughing on 50 acres of land. (18 hours were spent by the Uasin Gishu D.6 and terracer flattening out terrace banks.) 15 "V" shaped drains with a total length of 3,350 feet were made across logging tracks for Highland Saw Mills, Timboroa, by the Soil Conservation Service Tractor. 933 acres of land were set out for contour cultivation and grass stripping. 44 hours were spent by the Soil Conservation Service D.6 tractor angle-dozing.

NAKURU.—Fifteen acres of orchard land were marked out for contour planting.

ANNUAL REPORT OF THE OFFICER IN CHARGE (COFFEE SERVICES), 1947

Staff

On his return from leave in the United Kingdom at the end of April, Mr. A. R. Melville took over the position of Officer in Charge, Coffee Services, from Mr. S. Gillett who had already commenced his duties as Commissioner for European Settlement. Mr. R. W. Rayner, Plant Pathologist/Physiologist, Dr. H. C. Pereira, Agricultural Chemist, Mr. W. H. Hewitt, Assistant Agricultural Officer, and Mr. C. W. Shorman, Junior Laboratory Assistant, continued to work as members of the Coffee Team at the Scott Agricultural Laboratories, Nairobi.

Mr. Hewitt ceased to work as a member of the Coffee Team on 31st December, 1947. Mr. P. A. Jones, Agricultural Officer, joined the staff at the Coffee Research Station in March, 1947..

Mr. E. Cottington, Senior Assistant Agricultural Officer, continued to work at the Coffee Research Station.

Mr. J. T. T. Schouten, Assistant Agricultural Officer, continued to work in the West Rift area, being stationed at the Kitale Experimental Station. Mr. A. G. C. Hunt, Field Assistant, took up his duties at Ruiru in September. In January, 1948, Mr. J. R. Russell, Assistant Agricultural Officer, arrived on first appointment and was posted to Ruiru. At the beginning of March, 1948, Mr. J. E. West, Clerk in Charge, joined the staff at Ruiru. The actual staff position at the end of the year was as follows:—

Officer in Charge.—A. R. Melville (Senior Entomologist, (Coffee)).

Agricultural Officer.—P. A. Jones.

Entomologist.—Vacant.

Plant Pathologist/Physiologist.—R. W. Rayner.

Agricultural Chemist.—H. C. Pereira.

Senior Assistant Agricultural Officer.—E. Cottington.

Assistant Agricultural Officers (2).—J, T. T. Schouten and J. R. Russell

Clerk in Charge.—J. E. West.

Field Assistant.—A. G. C. Hunt.

Junior Laboratory Assistant.—C. W. Shorman.

Coffee Research Station, Ruiru

Development of the station proceeded steadily during the year. Three staff houses and certain outbuildings to the Laboratories which had been commenced during 1946 were finally completed and four further staff houses were commenced and virtually completed by the end of the year. It is unfortunately not possible to report that the main laboratory and administrative buildings were commenced in 1947, this project not having been accorded a sufficiently high degree of priority by the Public Works Department.

The building and development programme on the estate which is a departmental commitment has progressed satisfactorily in spite of present day difficulties in obtaining artisans and materials. A new circular water reservoir to hold 62,000 gallons has been completed. This is the head for the proposed new factory lay-out, work upon which has now commenced, and the water clarification and filtration plant which supplies the staff houses and the laboratory. A large new store and mill house has been constructed and good progress was made on the African staff housing scheme. A stone 10-light propagating frame was built for use on the vegetative propagation work. Important modifications and repairs have been made to the original estate factory building to provide storage space, and the coffee drying grounds have been extended and 20 new tables added.

The coffee crop amounted to 23 tons of clean coffee, (excluding "lights" and mbuni), and the total crop proceeds should exceed £3,500. Of the total, 4.53 tons were classified as Class 2 and 8.38 tons as Class 3.

In connexion with the scheme for pasture improvement, work has commenced in earnest on bush clearing. The best land on the estate is devoted to coffee experiments and near to the coffee areas, elephant grass (*Pennisetum purpureum*), has been planted to provide mulching material for coffee and fodder for cattle. Outside the coffee and elephant grass areas there is little land left which is not too steep to break, but it has been possible to find five areas of approximately five acres each which are being planted on a ley system allowing for the taking of silage crops during the break-up period. Two of these paddocks have now been fenced. The remainder of the rough grazing will in due course be divided into roughly equal areas which will be fenced so that observations on their treatment, reaction and composition can be made. The object of this work is to study the possibilities of raising the stock-carrying capacity of the land, thereby increasing the organic manure available for the coffee by a general intensification of the farming system.

On the stock side the Boran herd has been maintained. The total herd is at present 65 head, including bulls, cows, work oxen and all followers. The intention is to maintain the Boran herd which is milk recorded and to put a proportion of the cows in calf to the Channel Islands breeds by artificial insemination.

The usual tree planting programme was carried out on the estate.

The 1947-48 Crop Year

In the main East Rift area, a very heavy flowering in February to March followed the good short rains at the end of 1946. There was every prospect of the crop being a record one for the Colony, both in quantity and quality, but the shortage of rain in the latter half of the year altered this. Though there was only a slight lessening of the total crop there was considerable financial loss to many planters through their dropping several classes in quality below the expected mark, and this happened in spite of a general improvement in factory work.

During the early part of the season good quality coffee was harvested but as the season advanced much of the crop was picked as yellow cherry. Leaf rust was more prevalent than it has been for some years and its ravages extended to the higher altitudes also. There is but little to report in the way of progress with compost making on coffee plantations during the year though there are welcome signs that the coffee industry is becoming more cattle minded. In lieu of anything better the low quality *boma* manure from the plains continues to be used though it is to be hoped that an increasing number of farmers will follow the recommendations of the Agricultural Chemist and add bulky organic matter to this material on the farm.

West of the Rift, the prevailing conditions produced an early harvest, which, in addition to its beneficial effect on the current crop, should have an important bearing on possibilities for 1948–49. Probably as a direct result of the present high prices for coffee there is a renewed interest in the crop west of the Rift and there is some evidence of efforts to resuscitate some of the semi-derelict acreage. Coffee is grown in this area under a wide range of conditions and systems of management and it is accordingly difficult to generalize but it would seem that the best results are obtained when coffee is given first place.

Coffee requires rather special attention and if it does not get it at the right time it will frequently fail to give a return. Much depends on the interests and inclination of the individual but once this fact is appreciated then there is no reason why coffee should not succeed whether it be on a full plantation scale or a small acreage on a mixed farm.

Field Experiments on the Coffee Research Station and Sub-stations

The programme of investigational work has been continued at the Coffee Research Station, Ruiru, and experiments and variety trials have been maintained at the following sub-stations:—

Kitale Experimental Station; Kentmere Estate, Kiambu; Anmer Estate, Kiambu; Karimani Estate, Thika; Kitito Estate, Makuyu; and Kapretwa Estate, Elgon.

The reports of Mr. P. A. Jones, Agricultural Officer, and Mr. J. T. T. Schouten, Assistant Agricultural Officer, which deal with this aspect of the work of the Coffee Services are given in full below.

Entomological Work

With his appointment as Officer in Charge, Coffee Services, Mr. Melville had no opportunity to carry out any research work other than a few *ad hoc* investigations. The mealy bug parasite work has been maintained. Generally speaking, the control of mealy bug by biological means has been satisfactory, though there have been the usual localized cases of parasite failure, especially in the Donyo Sabuk District where there have been serious breakdowns on several estates. These localized breakdowns are caused by a hyperparasite (*Pachyneuron* sp.), which, under certain conditions not yet clearly understood, is capable of severely depressing the introduced parasite *Anagyrus* sp. near *Kivuensis* Comp. When another entomologist joins the Coffee Services, research on this problem will be carried out and this will include an attempt to introduce further species of parasites from Uganda. Only five of the primary parasites discovered by Melville in Uganda in 1938 were introduced. Other primary parasites were found which remain to be tried and it is hoped that one or more of these will prove to be stronger supporting species to *Anagyrus* near *Kivuensis* Comp. than any of the other species so far introduced. Towards the end of the year, a marked rise in populations of Capsid bug (*Lygus coffeæ* China) occurred as a result of intermittent flowerings, and necessitated control measures in several areas. Similarly there has been quite a sharp rise in *Antestia* populations and control measures on quite a large scale have had to be taken.

Plant Pathology and Physiology

Research on coffee pathology and physiology had to be reduced somewhat during the year owing to the fact that Mr. Rayner had to act for the Senior Plant Pathologist who was on leave in the United Kingdom, and that he also had to administer the plant quarantine and importation regulations during the illness of the officer in charge of this work. During the year Mr. Rayner carried out a detailed investigation of the effect of Raoeng pulping as compared to normal fermentation on coffees from the Upper Kiambu area. The investigation of the anatomical changes accompanying flower bud development and differentiation were continued as were Mr. Rayner's studies on the measurement of soil moisture and on coffee growth and flowering.

The year was marked by fewer reports of physiological upsets than in past years, due no doubt to the better growing conditions. However, the relatively heavy showers in January and February caused leaf rust (*Hemileia vastatrix* B. and Br.) to become destructive after several years of practical eclipse. Mr. Rayner's report is given in full below.

Chemistry

Cultivation, manurial and uniformity trials were carried out at the Coffee Research Station by Dr. Pereira, and smaller trials of nutrient sprays and copper injections at the Scott Agricultural Laboratories. Results for the first year suggest the cultural treatments influencing soil moisture, and fertilizer applications of

nitrogen are the two most important field factors in unshaded coffee. Laboratory work has been mainly devoted to assessment of fertilizer uptake by foliage analysis, and to the development of practical field methods of continuous quantitative measurement of soil moisture, together with a sampling method for soil structure.

A considerable portion of Dr. Pereira's time has been devoted to assisting other departmental officers in the design of experiments and the analysis of results. In return for these services, the Senior Agricultural Chemist at the Scott Agricultural Laboratories provided staff to carry out certain chemical investigations for the Coffee Services, which could not otherwise have been undertaken. Dr. Pereira's report is given in full below.

Vegetative Propagation of Coffee

Continuing his work on the vegetative propagation of *Coffee arabica,* Mr. Cottington has built a new 10-light propagating frame and developed a very successful technique for the production of rooted cuttings under local conditions. Material has been brought from parent trees at the Scott Agricultural Laboratories and certain sub-stations and has been established as grafts on nursery seedlings. The object of this work is to build up a reservoir of parent material on the Coffee Research Station from which rooted cuttings can be produced on a large scale in the future.

Advisory Services

Essential advisory services were maintained during the year. Apart from the specialist branches, Mr. Cottingham carried out the general cultural advisory work for the East Rift area while that in the West was carried out by Mr. Schouten.

Coffee Research Committee

This Committee met at the Coffee Research Station, Ruiru, on two occasions during the year as under:—

9th Meeting.—11th March, 1947.

10th Meeting.—17th November, 1947.

The minutes of these meetings have been published in full in the Bulletin of the Coffee Board of Kenya.

This Committee continues to be a very useful liaison between the producers and the research workers, and the Coffee Team would like to take this opportunity of thanking members of this Committee and other members of the planting community for their co-operation and assistance on numerous occasions in connexion with investigational work.

Coffee Planters Day

A Coffee Planter's Day was held at the Coffee Research Station, Ruiru, on Thursday, 24th July, 1947.

Over one hundred coffee planters attended and spent an interesting afternoon hearing about some of the research work being carried out by the Coffee Team and in seeing something of the numerous activities of the Coffee Research Station.

Publications

The following articles and notes have been contributed to the Monthly Bulletin of the Coffee Board of Kenya during the period under review:—

1947

January—"Coffee tree banding for mealybug with a sprayed D.D.T. Emulsion" by S. Gillett and H. C. Pereira.

January—"D.D.T. for the protection of coffee drying groundsheets" by H. C. Pereira.

February—"A reminder on spraying for trips" by A. R. Melville. (Republished).

April—"Annual report of the Plant Physiologist and Pathologist, Coffee Services, for 1945" by R. W. Rayner.

April—"Phosphatic fertilizers for Kenya Coffee" by H. C. Pereira.

July—"A Note on yellowing symptoms in coffee" by R. W. Rayner and H. C. Pereira.

August.—"D.D.T. spray-banding for mealybug" by H. C. Pereira.

October—"Antestia and D.D.T.—A note" by A. R. Melville.

December—"Coffee Preparation" by E. Cottington.

1948

January—"Spraying against leaf rust in the East of the Rift areas" by R. W. Rayner.

February—"Tonic Copper Spraying" by R. W. Rayner and P. A. Jones.

March—"Manures and fertilizers" by H. C. Pereira.

March—"Some impressions of a tour of West Rift coffee areas" by A. R. Melville and P. A. Jones.

Special Tours

Mr. Melville and Mr. Jones were on tour in West Rift coffee areas in January, 1948.

Mr. Melville carried out an advisory tour in the Native coffee areas on Mount Kenya in February, 1948.

Acknowledgments

The Coffee Services would like to take this opportunity to thank Mr. C. R. Devonshire and the staff of the Liquoring Department of the Coffee Board for their help in connexion with the evaluation of a large number of experimental samples of coffee.

Finally, the Officer in Charge, Coffee Services, would like to thank the members of his team for their co-operation and support throughout a hard year's work.

A. R. MELVILLE,
Senior Entomologist (Coffee).

CULTURAL EXPERIMENTAL WORK, COFFEE SERVICES

Meteorological Data

Records were kept throughout the year at all the main stations and estates on which experimental plots were situated. The following table shows the monthly rainfall distribution from eight stations:—

A—Coffee Research Station, Ruiru.

B—Scott Laboratories, Kabete.

C—Karimani Estate, Thika.

D—North Kitito Estate, Makuyu.

E—Kentmere Estate, Kiambu.

F—Anmer Estate, Kiambu.

G—Agricultural Department, Kitale.

H—Kapretwa Estate, Elgon.

	A	B	C	D	E	F	G	H
January ..	7·41	3·43	2·55	4·01	4·05	4·82	4·68	3·17
February ..	0·15	0·44	0·15	1·35	1·80	1·48	1·45	1·23
March	8·23	7·71	10·30	6·83	7·10	7·11	2·89	3·66
April	14·12	11·94	13·48	11·92	14·15	16·12	7·67	13·47
May	5·98	8·76	6·33	4·56	14·82	7·40	7·70	9·30
June	3·33	2·96	2·29	1·46	4·84	6·76	2·45	5·62
July	1·99	1·64	1·45	0·27	1·41	1·51	7·50	7·84
July	1·99	1·64	1·45	0·27	1·41	1·51	7·50	7·84
August ..	0·10	0·07	0·17	0·22	0·34	0·42	6·76	4·99
September ..	—	1·02	3·38	0·89	3·45	0·77	3·59	5·43
October ..	4·60	1·03	0·30	1·45	1·35	2·83	2·17	2·10
November ..	4·18	2·68	5·44	7·39	4·80	5·00	0·17	0·85
December ..	2·43	2·00	1·26	4·76	1·67	3·23	1·74	0·75
Total	52·42	43·68	57·20	45·11	59·78	57·45	49·31	58·41
Number of Days	106	114	116	117	141	142	169	168

Field Trials—Coffee Research Station, Ruiru

Pruning Experiment

Re-establishing coffee after stumping, a comparison of the four systems of treatment, viz.:—

A—Multiple Stem.

B—Single Stem (uncapped).

C—Single Stem (capped).

D—Single Two Stem (uncapped).

The layout.—Six randomized blocks of four plots, each of 16 trees.

Summary of Results.—

1. *Crop Yields, for second year of bearing*:—

Mean Yield Cherry	A	B	C	D	General Mean	Standard Error
Lbs. per Plot ..	363·89	219·57	194·35	278·21	264·01	14·61
Cwts. per acre ..	88·35	53·31	47·18	67·55	64·10	35·47
Per Cent of G.M. ..	137·8	83·2	73·6	105·4	100	55·338

The Standard Error of a single plot yield: 35.78 lb. or 13.55 per cent of the mean.

The Standard Error of difference of treatment means: 20.658.

The mean differences between A and B, C or D are significant to the 0.1 per cent point. That between B and D is significant to the 5 per cent point. That for C and D is significant to the 1 per cent point.

2. *Die-Back Branches.*—Trees were scored individually for die-back, every primary and main bearing secondary counting as a unit in the score.

Die-Back Branches	A	B	C	D	General Mean	Standard Error
Mean Score per Plot	158·16	122·0	63·16	197·83	135·29	18·07
Per Cent. of G.M. ..	116·9	90·2	46·7	146·2	100	13·35

The Standard Error of a single plot: 41.25 or 30.48 per cent of the mean.

The Standard Error of difference of treatment means: 25.55.

The following mean differences are significant:—

C and D to the 0.1 per cent point.

A and C, B and D to the 1 per cent point.

B and C to the 5 per cent point.

These results lead to conclusions of a merely preliminary nature, since they are derived from the second season only, and at a time when the Single Stem System is not fully developed.

Crop Reduction Trial

By August it was obvious that the trees on the multiple stem system were bearing crop in excess of their capacity to mature. A comparison of the mode of stripping was considered desirable and consequently a small trial was laid down adjacent to the cultivation experiment.

In a 4 by 4 Latin Square of ten trees per plot, the treatments were:—

A—All crop removed.

B—Half crop removed at the terminal half of each primary.

C—Half crop removed at the base half of each primary.

D—Lower Bearing primaries removed to leave 50 per cent of crop.

1. Records were taken of the green berry stripped from the trees and the red cherry picked at maturity. These may be correlated with records of the adjacent trial and with subsequent observations.

2. *Rate of Recovery.*—Estimates of the rate of recovery were made by means of visual scores of all individual trees.

Summary of Results:—

Recovery Rate	A	B	C	D	General Mean	Standard Error
Mean Score	42·75	35·5	38·75	36·5	38·38	0·9780
Per Cent. of G.M. ..	111·4	92·5	100·9	95·1	100	2·548

The Standard Error of a single plot score: 1.958.

The Standard Error of difference of treatment means: 1.3829

The following mean differences are significant:—

A and B to the 1 per cent point.

A and D to the 1 per cent point.

A and C to the 5 per cent point.

B and C is significant to a value of probability: 0.1, that is, to the 10 per cent point.

3. *Die-Back Branches.*—Trees were scored individually for die-back, but the variation in the scores of plots of similar treatment was such that a variance ratio of a value of 1.616 was produced.

The minimum value for significance in this layout is 4.76.

The treatments could not be considered significantly different in respect of die-back therefore.

Spraying Experiment with Tonic Copper Sprays

On 17th May a preliminary trial was laid down to assess the relative effects of varying applications and concentrations of three types of spray. Records of yield of cherry, intensity of leaf-fall and die-back were measured. In a 3 by 3 by 3 factorial design with a single replication, the types of spray (T) used were, Carbide Bordeaux, Burgundy Mixture, and Perenox.

The concentrations (C) were 1 per cent, $2\frac{1}{2}$ per cent and 4 per cent. The rates of application (R) were nil, 2/3 pints per tree, 4/3 pints per tree.

The 27 treatment combinations were confounded into blocks of 9 plots; each plot comprised 24 trees.

Summary of Results—

1. Crop Yields (in lb. of Cherry):—

Factor	Main Effects—Totals		Factors	Linear Interactions: Totals
	Linear Response	Curvature		
T	—225·5	—235·5	TC	52·65
C	—121·00	—75·00	TR	203·70
R	—159·30	—30·90	CR	241·55
Standard Error	—126·3	—194·9	Standard Error	—103·1

The mean yields of plots receiving Bordeaux and Burgundy were significantly greater than those receiving Perenox to the 5 per cent point, although the linear response for T was not significant. The linear component of the interaction between concentrations and rates of application were significant to the 5 per cent point due no doubt to the excessive loss of leaf on plots receiving no application of copper spray. No other significance could be deduced from the results.

2. *Die-Back.*—Individual trees were scored on 14-10-47 for primary and main secondary branches showing die-back.

Factor	Main Effects—Totals		Factors	Linear Interactions: Totals
	Linear Response	Curvature		
T	—327	—87	TC	121
C	—106	—318	TR	265
R	—395	—429	CR	240
Standard Error	—179·9	—311·7	Standard Error	—146·9

The linear response for rates of application is significant to the 5 per cent point. Although the other direct responses show no significance, to a significance of 1 in 20 no application is inferior to the two rates of application used. No other significance is shown.

3. *Leaf-fall.*—A visual score for leaf-fall was assigned to half the trees in each plot. Two such sets of scores were compiled.

1*st Score* (18-8-47).

Factor	Main Effects—Totals		Factors	Linear Interactions: Totals
	Linear Response	Curvature		
T	—35	—3	TC	13
C	—45	—57	TR	23
R	—182	—102	CR	32
Standard Error	—18·24	—31·60	Standard Error	—14·90

The linear response for rates of application is significant at the 0.1 per cent point, that for concentration at the 5 per cent point.

Although there is no linear response for strength of spray, a 1 per cent concentration is inferior to the other strengths at the 1 in 100 level. The only significant curvature is that for rates of application at the 1 per cent point.

The interaction between concentration and rates of application is significant at the 5 per cent point.

2*nd Score* (25-9-47).

Factor	Main Effects—Totals		Factors	Linear Interactions: Totals
	Linear Response	Curvature		
T	—2	—20	TC	1
C	—50	—8	TR	6
R	—200	—98	CR	42
Standard Error	—24·01	—41·58	Standard Error	—19·61

The only direct linear response which is significant is that for rates o application, at the 0.1 per cent point, although the higher concentrations ar superior to a 1 per cent solution to a significant degree. The curvature for rat of application is significant to the 5 per cent point, as is the linear component o the interaction between concentrations and rates of application.

The results from the records of the first season shown above are interestin but cannot be regarded as conclusive. It would appear, however that there is littl to choose between the type of spray used, but that the rate of application an strength of solution are important factors. For the greatest tonic effect it i probable that an application of 4/3 pints per tree, at a strength of 2½ per cen or 4 per cent should be used.

Other Experimental Work

Three other field trials of shade trees and selections were maintained, bu none of these were sufficiently mature for recording. Part of the field work wa undertaken on the manurial and cultivation trials; the whole of the field side o the latter trial was taken over from the Agricultural Chemist in October.

Scott Agricultural Laboratories

Seed was obtained from two blocks of selected parent trees and grafts, bu the variability of the area was considered too great for further individual record to be taken.

Substations at Karimani Estate, Thika and North Kitito Estate, Makuyu

Seed was obtained from the selections on both sites. Yield records from eac selection and contingent controls were taken at Karimani.

Kentmere Estate, Upper Kiambu

The yields of seventy individual trees were recorded for cherry and clea coffee weights. Several of these produced good yields, but liquoring reports ar not yet available.

In connexion with the characteristic flavour an unreplicated cultivation tria was recorded for cherry and clean coffee weights; the reports of liquoring qualit are not available to date.

Anmer Estate, Kiambu

Owing to the generous assistance afforded by the owner, Mr. P. H. Coldhan it was possible to undertake the recording of individual trees within blocks c selections in comparison with adjacent controls. The number of individual tree serving as controls was doubled to produce more reliable results.

The records of two successive years will be analysed for statistical significanc in due course, when liquoring reports have been received.

Administrative Work

Due to the shortage of staff during the year a considerable proportion of th writer's time was taken up with general administrative duties, clerical and routin work on the Coffee Research Station.

P. A. JONES,
Agricultural Office

ANNUAL REPORT OF ASSISTANT AGRICULTURAL OFFICER (COFFEE), WEST RIFT AREA, 1947

Climatic Conditions

The rainfall for the year at Kitale Experimental Station was as follows:—

	Inches
January	4.68
February	1.45
March	2.89
April	7.67
May	7.70
June	2.45
July	7.50
August	6.76
September	3.59
October	2.17
November	0.71
December	1.74
Total	49.31

Average rainfall over 14 years: 45.75 inches.

The total rainfall recorded at the Experimental Station was above average. The amount recorded from January to March was double the average rainfall for this period.

This extra moisture undoubtedly had beneficial results on the coffee of the district keeping it in good heart.

However it also produced numerous flowerings at odd times during the year. It was not uncommon to find a flowering just setting whilst picking in November. The main crop of the district was harvested a good deal earlier than is the average, the benefits of which should be apparent to farmers during the 1948 season.

Experimental Work

Crop records and observations were continued on the Experimental Station and at Kapretwa Estate. The experiments in progress are:—

(i) *Mulching Experiment—Kitale.*—This experiment is in the form of a 4 by 6 randomized block, each block containing 24 recorded trees. The recorded trees are surrounded by one control row of coffee, which, although receiving the specified treatment, are not recorded.

The treatments are as follows:—

A—Mulching between rows of coffee only.
B—Mulching under the trees only.
C—Complete mulching over the whole plot.
D—No mulch (control).

The mulching material used was maize trash.

(ii) *Pruning Experiment.*—This experiment is laid out in the form of a 5 by 5 Latin square, each plot containing 16 recorded trees. The experiment is being carried out at both Kitale and Kapretwa. Blue Mountain coffee is being used at Kitale and Thorold's Series A at Kapretwa.

Treatments are as follows:—

A—Single stem pruning, primaries regulated to 15.
B—Single stem pruning, primaries regulated to 20.
C—Single stem pruning, primaries regulated to 25.
D—Single stem pruning, unreduced (at Kitale).
E—Multiple stem pruning (at Kitale).
D—Multiple stem pruning (at Kapretwa).
E—Jackson's pruning system (at Kapretwa).

(iii) *Manurial Experiment.*—This experiment is laid out in a 5 by 5 Latin square, each plot containing 18 recorded trees, with a control row of coffee between each plot.

Treatments are as follows:—

A—Control.

B—Control + Compost + Phosphates.

C—Control + Compost.

D—Control + Phosphates.

E—Compost + Phosphates.

In the above treatments control means the normal farm routine of growing lupins between the rows of coffee. These lupins are pulled and laid as mulch material when the dry weather sets in.

Compost was applied at the rate of 5 tons per acre, and phosphates by using guano at the rate of 400 lb. per acre.

(iv) *Size of Planting Holes Experiment.*—This experiment is laid out in 12 blocks, each block containing 25 trees, treatments being randomized and replicated five times in each block. Each tree has been individually recorded for yield since 1941.

Treatments are as follows:—

A—Size of planting hole, 1 ft by 1 ft.

B—Size of planting hole 1½ ft. by 1½ ft.

C—Size of planting hole, 2 ft. by 2ft.

D—Size of planting hole, 2½ ft. by 2½ ft.

E—Size of planting hole, 3 ft. by 3 ft.

The detailed records of these experiments to-date have been submitted for analysis.

Variety Trial and Selections.—Variety and selection trials are being carried out at Kitale and Kapretwa. During the year a severe attack of C.B.D. was experienced on those varieties bulked as Thorold's Series A at Kitale, whereas this was not the case at Kapretwa. At Kitale, these varieties are grown under a shade provided by *Acrocarpus fraxinifolius* and also without shade. All varieties are manifestly better under shade. As previously recorded, the Series A type is very suitable for the Mt. Elgon coffee farms, whereas the Blue Mountain type is better suited to the lower altitude farms based on sandy loam soils as at the Kitale Experimental Station.

Pests and Diseases

Antestia has not done so much damage to the coffee crop of the district this season as it has in the past.

A few planters are using a "Gammexane" mixture against this pest.

Capsid Bug (*Lygus coffeæ* China) was found in relatively large numbers by the Senior Entomologist on his visit to the area. As mentioned above, a series of intermittent flowerings has taken place on the coffee during the year which most probably accounts for this state of affairs.

Leaf eating caterpillar (*Metadrepana Andersoni* Tams) has caused damage to coffee chiefly in the Cherangani area.

Assistant Agricultural Officer.
J. T. T. SCHOUTEN,

ANNUAL REPORT OF THE PLANT PHYSIOLOGIST AND PATHOLOGIST, COFFEE SERVICES, 1947

General

It was not possible to devote very much time to coffee physiological research during the year under review, owing to lack of assistance and to the pressure of other work. From the beginning of July, I was appointed Acting Senior Plant Pathologist during the absence of the Senior Plant Pathologist, Dr. R. M. Nattrass, on overseas' leave. In addition, from September onwards, owing to the illness of the Officer in Charge, and to the absence of the Senior Entomologist on overseas' leave, I had to administer the plant quarantine and importation regulations. It was not until early in December, when Miss K. Westlake joined the staff at the laboratories, that any assistance was available for coffee investigations. A number of the activities connected with the setting up of the new Coffee Research Station, such as the preparation of plans for the laboratories, the compilation of indents and the discussion of research programmes have been responsible for a considerable expenditure of time, still further reducing that available for research.

In July, an exhibit demonstrating the value of root studies, the results of the growth-rate measurements carried on at the Scott Agricultural Laboratories, work on soil moisture measurement under coffee, and a number of abnormalities of the coffee bean, was set up for Planters' Day, 24th July, at the Coffee Research Station. Towards the end of the same month, I attended the Agricultural and Forestry Research Conference organized by the East African Governors' Conference in Nairobi.

The effect of Raoeng Preparation on Upper Kiambu Coffee

As the results obtained last year on the effect of Raoeng preparation on the quality of Upper Kiambu coffees were not clear cut owing to the lack of any markedly "strong" liquors in the coffee used, a further investigation along the same lines was carried out in the early part of the year. With the co-operation of the planters concerned, coffee cherry was collected three times during the picking season from three Upper Kiambu farms representing high, medium and low areas, and transported to the Coffee Research Station, where it was divided into two halves after thorough mixing. One half was pulped in a Mackinnon disc pulper and the other was passed through the Raoeng machine. The pulped coffee was divided into two halves and, in the case of the Mackinnon pulper, allowed to ferment in two separate piles. The two samples of Raoeng preparation were put straight out on to the trays to dry.

In due course, the samples were hulled and sieved by hand into "A" and "B" grades. Three sub-samples of each of these were made, given random numbers for identification and submitted at the rate of about thirty samples at a time to the Coffee Board's Liquorer, Mr. Devonshire, for examination. The results of his examination were scored in the manner used in the past for quality of raw, roast and liquor, for degree of development of the Upper Kiambu type of flavour and for general classification. These scores were analysed by averaging the scores for sub-samples, samples, method of preparation and for "A" as against "B" grades.

As regards commercial classification, Raoeng preparation was slightly beneficial in four cases and slightly adverse in the remaining four, so that, on the whole, spread over the three estates and the three picking dates, there was no effect on commercial classification.

It was noteworthy that variation between the replicate samples of Raoeng preparation was lower, often much lower than between normal fermentation replicates, the mean differences being one-third of a class for the Raoeng and 2 classes for the normal fermentation, there being one case in the latter of a difference of two classes between the separate fermentations carried out under the same conditions on samples of cherry from the same bulk.

The effect of the Raoeng preparation on the raw was to turn out an average product of somewhat poorer colour (browner) and greater foxyness to the best result of normal fermentation, but of better colour and less foxyness than that produced by the worst result of normal fermentation. Thus, normal fermentation would be superior, if a means could be found of ensuring that it always worked at its best. The cases of superiority of Raoeng preparation as regards commercial classification could all be traced to a better raw appearance than given by the normal fermentation.

In all cases, the roast of the Raoeng prepared coffee was poorer, usually only slightly so, than that prepared by normal fermentation. This was due to a tendency for a duller, more uneven roast with browner centre cuts.

Raoeng preparation improved liquor in four cases out of eight, and this was associated with a lessening of the Upper Kiambu type of flavour. In five cases, it led to a lessening of this type of flavour, but this was not necessarily associated with improved liquor classification. In three cases, a more pronounced Upper Kiambu liquor was obtained, but there is some suggestion that this may have been due to the samples concerned having been produced when the machine was not functioning well. Although Raoeng preparation led, in the majority of cases, to a less Upper Kiambu type of flavour, in no case was the liquor sufficiently improved to have any effect on the general commercial classification of the coffee.

The impression was gained that in the case of average Kiambu coffees, improved commercial classification would result from better raw appearance rather than from improved liquor. It is only with coffees having a good raw, that much improvement can be obtained from better liquors. As the appearance of the raw can be easily judged by the planter, based as it is largely on colour, it is possible that considerable improvement of Upper Kiambu coffee classification would be obtained by the planter himself making critical observations on fermentation practices and their effects on raw appearance.

With few exceptions, the effect of Raoeng preparation on the "B" grade was strictly parallel to its effect on the "A" grade. Although the commercial classification of the "B" was usually about a class lower than for the "A", the raw was better in appearance and the roast and liquor about equal on the average. In the majority of cases it had more developed Kiambu characteristics.

I have to thank Mr. R. A. Somerville of Kahora Estate, Mr. H. T. Wells of Bano Estate, and Mr. Aagard of Njuno Estate for so generously supplying me with coffee cherry from their respective estates. I have also to thank Mr Devonshire for his continued help in this investigation.

Investigation of the Anatomical Development of the Inflorescence Bud

This investigation, which was commenced last year, was continued and a large number of further dissections made and material for eventual sectioning embedded in wax. The development of both long rains and short rains flower buds have now been followed from initiation up to flowering. The dissections have been recorded by means of camera lucida drawings and it now remains for the dissections to be compared and the results analysed and for a large number of microtome sections to be cut so that more precise measurements and observations on the development of the growing tissues may be made.

Soil Moisture Measurement

Further investigations were carried out in order to find an improved method of calibration of the Bouyoucos plaster of Paris blocks.

Kelly (1) has suggested a method in which the blocks are encased in a surround of powdered soil from the horizon in which they are to be installed

etained in a cloth lined basket, wetted and allowed to dry out in stages, being rought to equilibrium at the end of each stage by being kept for a period in moist chamber. By weighing the units, the change of soil moisture determined ravimetrically can be followed in relation to the change of resistance of the Bouyoucos block. As the powdering of the soil considerably disturbs the structure f Kikuyu red loam, however, especially in the deeper horizons, and consequently vill alter its soil moisture tension to soil moisture content relations considerably nd since the blocks depend on the moisture tension and not the moisture content f the soil, it was decided that an attempt should be made to use Kelly's method n undisturbed cylinders of soil into which the blocks would be placed.

The method was to sink the blocks into a space just large enough to ccommodate them in soil at 3 in., 1 ft. and 3 ft. depths. A cylinder of soil urrounding each block was then carefully carved out, sewn up in thin cotton loth and transported to the laboratory. Two cylinders were obtained at each epth. They were saturated in water and allowed to drain in a moist chamber. They were then allowed to dry in stages in the open laboratory for a few hours, being eft in a humid chamber between each stage until they appeared to have reached steady resistance reading for the blocks. Weight and resistance readings at each tage were then taken. When they had reached a resistance reading just short of he maximum for the meter used (an A.C. direct reading impedance meter)* the noisture content of the soil was obtained by oven drying samples from the urface, middle and innermost layer of the column surrounding the block. A small but appreciable gradient in soil moisture percentage was found ranging from 0.51 to 0.89 per cent. From these figures and from the known relation of block esistance to block moisture content, the moisture contents of the soil of each f the drying stages could be calculated and curves relating soil moisture content o block meter reading could be drawn. Although there were some peculiar nomalies, it was evident that each depth had its own type of curve, reflecting he expected differences in the soil moisture content to tension relations. The curves were all of a sigmoid form, but differed in the slope of the middle limb, which vas steeper in the soils from the greater depths, and in their starting and finishing oints. Figures for the water retained against draining and for the wilting point calculated from a meter reading of 48) are as follows:—

Depth	*Water Retained Against Gravity* *Per cent*	*Wilting Point* *Per cent*
3 inches (topsoil)	51.1	24.8
	53.4	24.2
1 foot (top of subsoil)	50.9	27.5
	51.2	29.5
3 feet (subsoil)	60.3	28.3
	59.8	30.5

Some of the anomalies may have been due to the formation of a conducting kin round the outside of the blocks in saturated soil, since the block resistances ell considerably from the readings given after 24 hours in saturated calcium ulphate solution, when kept in the saturated soil. Dr. Pereira has since observed hat this effect is eliminated if screened cylindrical blocks are used.

At the end of the experiment, it was found that the block impedance meter eadings in saturated calcium sulphate solution had increased considerably since heir first determination soon after casting. Tests on further unused blocks cast t the same time showed that this was a curing effect and shows that blocks must e cured, preferably by storing in a moist atmosphere for a few weeks, before eing used.

* *See* Annual Report for 1946.

The time taken to reach equilibrium at each stage was often very long, amounting to two to three weeks at times. The method is, therefore, not suitable for routine calibration of the blocks.

Since, for plant physiological investigations, it is more important to have blocks calibrated for soil moisture tension rather than soil moisture content, the freezing point method of Botelho da Costa (2) was investigated. This has been used for soils and is somewhat laborious as it requires freezing point determinations at each of a series of moisture contents if a complete pF-Moisture content curve is to be produced. It was thought that by determining the block impedance as gradual melting occurred, it might be possible to produce a calibration curve in one set of observations.

Blocks were produced with incorporated copper constantan thermocouples, wetted and frozen. They were then suspended in corked, wide-mouthed bottles surrounded by a bath of melting ice. The temperature of the gradually melting block was taken at intervals and concurrently readings were taken with the impedance meter. The temperature was obtained using a potentiometer circuit, and comparing the difference between readings for thermocouples in melting ice and a standard temperature (about 20°C) and thermocouples in the block and the standard. Anomalous curves were at first obtained, which were possibly due to too rapid melting. By reducing the rate by placing the ice bath in a refrigerator, a smooth curve giving a pF† of about 3.80 at the point on the meter scale which is considered to represent the wilting point from field observation. The curve was almost asymtotic from pF 3.2 to pF 4.3, then curve downwards gently to pF 3.2 after which rather erratic readings about a vertical line were obtained. This region possibly corresponds to the freezing point depression due to the saturated calcium sulphate solution in the block.

The method was found to be technically difficult and due to the effect of the saturated calcium sulphate solution only applicable to the upper range of pF values.

A year's experience of the functioning of the blocks installed at 3 in., 8 in., 1 ft., 3 ft., 6 ft. and 9 ft. under coffee has now been obtained. The greater rapidity of soil drying during January and February, as compared to July to September, both relatively rainless periods, is noteworthy. In fact, in the much drier period following the long rains, the profile had a maximum depth in which soil moisture was in the available range, whereas just before the onset of the long rains, in a profile under the canopy of a coffee bush, there was practically no available moisture. Following the short rains of 1946, available moisture did not penetrate to the 9-ft. depth and although January and February were exceptionally wet (3.97 inches) and good falls were obtained at the commencement of the long rains from the 28th February, it was not until two months had elapsed and 20.57 inches had fallen that available water penetrated to the 9-ft. level. The observation made last year, that drying may continue at depth, whilst wetting is occurring nearer the surface, was repeated several times. On the watered block, the difficulty of maintaining the profile at a high level of moisture availability during drought spells with high radiation intensity by adding water to the surface, was noteworthy.

It is, as yet, too soon to attempt any correlation of moisture availability to coffee growth, but it is of interest to note that during August when rainfall was slight, there was a minimum growth period, which could not have been connected with soil moisture availability which was very high at this time.

---

† Calculated from the formula given by Schofield (3) for connecting freezing point depression to pF.

A method has been worked out, using a block impedance level slightly below the wilting point as indicative of the upper limit of water available for growth, by which the number of days that any level of the profile has no water available for plant growth can be depicted graphically. This method should make possible rapid comparisons of water availability under various treatments, such as depths of cultivation, mulching, shading, type of shade tree, etc. This method avoids the necessity of precise calibration of the Bouyoucos blocks.

Growth Observations at the Scott Agricultural Laboratories

Growth never reached a high rate during the year but maintained a rather even level with maxima at the end of January, the beginning of April and from August to October. There was a well marked minimum in June–July, which as previously noted, was not connected with deficient soil moisture. This is a repetition of the phenomenon observed in 1942 and is considered to be largely due to the low radiation intensities and low temperatures, which occur at this time of the year. There were less well marked depressions in December–January and in February, presumably to be associated with the marked drop in moisture availability at these times. The low growths recorded for the very good long rains were rather surprising and perhaps may be partly accounted for by the thickness of the trees due to the marked growth period of the short rains of 1946. The flowering, which occurred mainly at the onset of the rains, was fairly heavy and a good crop was obtained from the trees at the end of the year. This, no doubt, exerted a reducing effect on the short rains growth, for although these rains were extremely poor, there still remained ample moisture in the soil.

The watered trees have shown, on the whole, similar trends, but the 1946 short rains growth was much less and this may be the reason for the much better growth that these trees made during the long rains.

R. W. RAYNER,
Plant Physiologist and Pathologist, Coffee Services.

REFERENCES

(1) Kelly, O. J.—"A rapid method of calibrating various instruments for measuring soil moisture in situ", *Soil Sci.* 58, p. 433, 1944.

(2) Botelho da Costa, J. V.—"The indirect determination of the wilting coefficient by the freezing point method, and the influence of the salts upon pF at that critical moisture content", *J. Agric. Sci.* 38, p. 654, 1938.

(3) Schofield, R. K.—"The pF of water in Soil", *Trans. 3rd Internatl. Cong. Soil Sci.* 2: 37–48, 1935.

ANNUAL REPORT OF THE AGRICULTURAL CHEMIST, COFFEE SERVICES, 1947

Study of coffee problems on first arrival in June, 1946, had indicated two main lines of investigation for 1947. The first was in soil moisture and soil structure relationships, and the influence of weed-control and cultivation policies in combatting the alternate effects of drought and soil erosion. The second was the estimation, from the coffee crop, of the economic value of fertilizer and manurial dressings. In spite of high annual expenditure by the industry on fertilizers and manures, no economic responses by the coffee crop have yet been substantiated in Kenya. Of these two sets of problems, the first is clearly of more urgent importance to the industry, and has been given priority.

The new Coffee Research Station had, at the beginning of 1947, neither equipment nor staff to undertake the large-scale manurial and cultivation experiments required, but since all such field treatments of a perennial crop are cumulative in effect, it was decided to get two field trials under way immediately. Much of the year was, therefore, spent in the field, in organizing, setting out and conducting treatments on a 162-plot 3 by 3 by 3 by 3 cultivation and weed control experiment and a 108-plot 3 by 3 by 3 manurial trial, together with minor uniformity, copper injection and other experiments at the Scott Agricultural Laboratories. Work in the laboratory had to be confined to soil moisture and soil structure studies and to foliage-extract ("tissue test") analysis for the uptake of nutrients from the field trials. Late in the year, improvements in the staff position made it possible for the Agricultural Officer to take over most of the field operation of the experiments.

Soil Moisture Measurement

The electrical recording method begun by Mr. Rayner in 1946, was studied to evolve a technique for continuous quantitative measurement of the soil moisture conservation effects of field treatments. The A.C. voltmeter measuring apparatus was calibrated by a new portable A.C. bridge lent by the East African Agricultural Research Institute, so that results were comparable with the extensive recent American work on this method. The flat Bouyoucos-pattern blocks were found unsuitable for quantitative work in wet soils, since, in a freely drained wet soil over half the current was found to pass outside the block. A practical method for the construction of screened-electrode cylindrical-pattern blocks in the laboratory was worked out, and the characteristics of the new blocks were studied by repeated wetting and drying cycles in vapour chambers of controlled humidity. The blocks record, by changes in electrical resistance, changes in the tension of the films of water in the soil. Oven drying of soil samples has shown the relationship between resistance of the blocks and the percentage moisture-content of the soil to be sufficiently consistent for practical purposes while the soil is drying out, and the method will, therefore, be used in the cultivation and weed control studies in 1948.

Available Moisture.—Oven drying of soil samples from under coffee after drought periods showed that the "Wilting Point" or percentage by weight of moisture held too strongly by the dry soil for crop use, was about 24 per cent in topsoil, rising to 28 per cent in subsoil at 4 feet depth. The pressure-membrane method, evolved in the U.S.A. by Richards and Weaver (1943 and 1944) makes possible the direct and rapid determination of the wilting points of soil samples by the application of compressed air at 15 atmospheres (about 220 lb. per square inch). Apparatus constructed by a local firm of engineers for this work has been set up at the Scott Agricultural Laboratories, for the study both of soils and of moisture recording blocks.

Measurement of pore space in clods of soil of undisturbed structure have been made by the technique of Russell and Balcerek (1944) (immersion in paraffin under vacuum). The air-water-soil relationships thus measured will be the criteria for the soil restoration experiments proposed by the Coffee Team for certain badly eroded

eas of the Coffee Research Station. Some results from a preliminary study of a ikuyu Red loam profile at the Scott Agricultural Laboratories are given in able I.

TABLE I—KIKUYU RED LOAM PROFILE (FALLOW, TOP SIX INCHES CULTIVATED) ORE SPACE EXPRESSED AS INCHES PER FOOT OF SOIL OF UNDISTURBED STRUCTURE

Surface	Volume of Soil Particles	"Capillary" Pore Space	Freely Drained Pore Space	Saturation Pore Space	Volume of Water Retained at Wilting Point	Soil Storage Capacity for "Available Water"
	(*a*)	(*b*)	(*c*)=(*d*)–(*b*)	(*d*)	(*e*)	(*f*)=(*b*)–(*e*)
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
6 in. – ft. 6 in.	4·72	4·46	2·82	7·28	3·06	1·40
ft. 6 in. – ft. 6 in.	4·83	5·30	1·87	7·17	3·30	2·00
ft. 6 in. – ft. 6 in.	5·08	6·60	0·32	6·92	3·89	2·71

Undisturbed clods of wet topsoil, taken from the field shortly after rain, had bout 90 per cent of the "capillary" pore space occupied by water.

Cultivation and Weed Control

Suitable conditions for subsoiling had not occurred up to the time of picking, o that the original 3 by 3 by 3 by 3 design became 3 replications of a 3 by 3 by 3 actorial, confounded into blocks of 9 plots.

3 Implements	*3 Depths*	*3 Weed Controls*
Jembe ..	2 inches	Clean weeding by frequent cultivation.
Disc ..	2 inches plus one 4 in. to 5 in.	Slashed, plus cultivation at end of rains only.
Plough ..	4 in. to 5 in.	Full weed stand cultivated at end of rains only.

The first season's cultivations were carried out under the severe handicap of he need to borrow tractors and implements on day to day arrangements. After our months, a Fordson Major was purchased, but suitable implements were not btainable, and much time was spent in searching for second-hand implements nd adapting them for use. The frequencies and depths of cultivation were, owever, maintained, and the main contrasts among the 27 treatments were ffected. Weed growth estimates by a visual scoring system gave useful checks n cultivation efficiency. By the end of the long rains, in June, a heavy stand f tall weeds, a thick carpet of slashed weeds, and well tilled weed-free plots vere compared. Foliage extract (tissue test) analysis of all plots for nitrate nitrogen howed no significant differences.

In mid-August, as the first ripe cherry appeared, a severe attack of *hemelia astatrix* on nearby plots threatened this experiment. The crop was already

excessive and the experiment was therefore, stripped completely to safeguard future long-term results, since the combination of crop and leaf disease would have caused severe root dieback. Thirty tons of cherry were weighed to the nearest ¼ lb. per plot. The coffee is 10 ft by 10 ft. multi-stem, and has recovered well from stumping.

Yields in Pounds of Cherry per Plot of 40 trees

Depth of Cultivation	Weed Controls			Means (± 26·6)
	Clean Weeded	Slashed	Full Weed Stand	
2 inch	832·9	797·5	794·9	808·4
2in. plus one 4in.-5 in.	842·4	840·2	813·4	832·0
4 inch.–5 inch. ..	881·1	758·8	843·6	827·8
Means (± 26·6) ..	852·1	798·8	817·3	

Differences of 53 lb. in the marginal means are significant at the 5 per cent level. The Standard Error per plot is ± 98 lb. and the Coefficient of Variation is 11.9 per cent.

The crop carried by the clean weeded plots was significantly higher than that on the slashed plots alone, and significantly higher than the mean of all slashed and weed-stand plots. Of single treatments, those cultivated most deeply and frequently carried significant more crop than the mean of all other treatments. Other apparent yield differences lie within the range of experimental error.

Interpretation of Results.—The experiment gives evidence of stimulation to increased bearing by frequent deep cultivation, and depression of crop by the slashing of weeds. It must be emphasized that unshaded coffee at this altitude is already stimulated to frequent and harmful overbearing by exposure to sunlight alone, and that, for practical purposes the slashing of weeds, by protecting the soil and restraining the crop, may prove to be the better treatment. This can only be judged by consistency of cropping in successive years.

Small Self-Propelled Implements.—Two small single-cylinder motor-cultivators were tested during the year. The opinion so far reached is that for post-rains cleaning of hilly *shambas* which have been allowed reasonable anti-wash weed cover during the rains, an implement of at least 10 h.p. is required, preferably with variable-speed gearing. Smaller engines have to be worked too long on full throttle by semi-skilled drivers and tend to be run under conditions of excessive "wear and tear". They are also narrow in relation to the distance between trees. On flat *shambas*, where clean weeding is practised, smaller power units of five or six horse-power may prove to be economical.

Statistical Analysis

Further data on the variability of coffee yields was obtained by analysis of individual tree records in plot totals of from five to fifty trees over periods of one to five years.

Early in the year arrangements were made for the writer to act for the Director of Statistics, in assistance to Officers of the Agricultural Department in the design and analysis of experiments. The Senior Agricultural Chemist undertook certain analytical work for the Coffee Services in order to provide time for this.

In addition to coffee experiments, data analysed included one 2^1 factorial trial, two balanced incomplete block trials and two randomized block trials. Field experiments designed included two balanced incomplete-block variety trials, a 2^4 factorial design as an 8 by 8 quasi-Latin square, and a set of five 3^4 trials as 9 by 9 quasi-Latin squares. The ready assistance of the Statistical Department is gratefully acknowledged.

Field Trials of Manurial Treatments

Soil.—A flat uniform area with 8 in. to 12 in. topsoil of fair crumb-structure. Prior to experiment, the area had been heavily mulched with Napier Grass (alternate rows) for two years, and had received "light dressings" of superphosphate.

Coffee.—10 ft. by 10 ft. single stem partially regrown after complete stumping, and very uniform in appearance. Plots were of 20 trees, in two rows of ten, surrounded by guard rows.

Design of Experiment.—3 by 3 by 3 factorial, partially confounded into twelve blocks of 9 plots, in four balanced replications.

Treatments—

Nitrogen.

n_0: Nil.

n_1: 1 cwt. per acre sulphate of ammonia.

n_2: 2 cwt. per acre. sulphate of ammonia.

Phosphorus.

p_0: Nil.

p_1: 45 lb. per acre total P_2O_5 (7 lb. per acre were citric-soluble) given as 2 cwt. per acre soda phosphate.

p_2: 90 lb. per acre total P_2O_5 ($3\frac{1}{2}$ lb. per acre citric-soluble) given as $3\frac{1}{4}$ cwt. per acre Uganda Rock phosphate.

Organic Matter.

c_0: Nil.

c_1: One debe of compost per tree ($6\frac{1}{2}$ tons per acre).

c_2: Two debes of compost per tree (13 tons per acre).

The compost was of Napier Grass and cattle manure from the estate dairy. When both were given to the same plot, the phosphates were added during preparation of the compost.

The crop was not excessive ($5\frac{1}{2}$ cwt. per acre) and no crop reduction was therefore attempted. Strippings are not included in the yield totals below.

(*a*) *First Year's Crop Yields.*—(Mean yields in cwt. clean coffee per acre):—

	c_0	c_1	c_2	n_0	n_1	n_2	Means
p_0 ..	5.24	5.41	5.74	5.42	5.48	5.49	5.46
p_1 ..	5.66	5.38	5.15	5.57	5.05	5.58	5.40
p_2 ..	5.62	5.61	5.30	5.59	5.44	5.50	5.51
Means	5.51	5.47	5.40	5.53	5.32	5.52	5.46

	n_0	n_1	n_2
c_0 ..	5.86	5.27	5.39
c_1 ..	5.62	5.19	5.60
c_2 ..	5.10	5.51	5.58

Significant Differences at the 5 per cent Level.—0.45 cwt. between yields in the body of the table. 0.26 cwt. between marginal means.

Standard Error per plot = ± 0.55 cwt. per acre.

Coefficient of Variation = 10.14 per cent.

Main Effects.—There was no overall crop response, in this first season, to either nitrogen, phosphorus or compost dressings.

Interactions.—The linear interaction of nitrogen on compost is significant at the 1 per cent level and shows that the compost, given without nitrogen, depressed the crop yield by over half an hundred weight per acre. This indicates that the method of preparation had not been adequate to produce a compost usable on its own. The depression of the crop by both levels of nitrogen, in the absence of compost, may have been due to increased vegetative growth, since dieback was significantly reduced, as shown below. Its long term advantage should be shown by subsequent crop behaviour.

The linear interactions of both total and citric-soluble phosphoric acid with compost were significantly negative at the 1 per cent and 5 per cent levels respectively. Compost, and either form of phosphate, gave significant crop increases when used alone, but had no effect when used together. This is an unexpected result, which will be further investigated.

(*b*) *Effects of Treatments on Dieback.*—On the 29th October, near the end of the picking season, considerable die-back was observed throughout the experiment, and a complete count of all died-back wood was made on the 2,160 trees. Analysis of the results shows no effect of either phosphates or compost on the incidence of died-back, but a significant reduction due to nitrogen dressings. One hundredweight of sulphate of ammonia gave an 11 per cent reduction and 2 cwt. gave a 17 per cent reduction in the number of died-back branches. Since root die-back has been found in the past to accompany die-back of branches on a comparable scale, this may be expected to show marked effects on the next year's crop. This well illustrates that, in a perennial crop, only partial conclusions can be drawn from treatment effects on the current season's yields.

(*c*) *Foliage Tests for Uptake of Nutrients.*—Extensive foliage samplings on all treatments of the trial were made on four occasions during the picking season. Using Morgan's Solution (acetic acid buffered to pH 4.8 by sodium acetate), extracts of fresh tissue were made from leaf laminæ, leaf midribs, and from the green wood of the young primaries, all at the base of the leading vertical shoots of the capped single stem trees. The latter samples gave the most consistent results for replicates in the first test, and were used for subsequent samplings. It is most important that the same type of tissue be taken from each tree, since there is marked variation in the levels of soluble nutrients in foliage at different stages of growth. Nitrate nitrogen levels were low and very variable, no consistent treatment effects being observable. Soluble phosphates on plots receiving either soda-phosphate or Uganda Rock phosphate were greater than on controls, the soda-phosphate giving consistently higher results, indicating greater uptake by the trees.

(*d*) *Effects on Earliness of Ripening.*—Graphs were plotted showing the percentage of total crop collected at each picking, for the tree levels of the three main treatments. No effects were produced by nitrogen, phosphorus or compost application on the earliness of ripening.

(*e*) *Effects on Quality of Crop.*—Samples from all 27 treatment combinations were fermented separately in wooden boxes on four occasions. Clean coffee ratio, hulling loss and size of bean (per cent A grade, per cent A and B grades) were studied, and triplicate samples of A grade coffee from one complete set of 27 treatment combinations were submitted to Mr. Devonshire for liquoring and classification.

Clean Coffee Ratio.—Mean 6.00 ± 0.042 nitrogen and compost showed no effect. Phosphates gave a small and consistent increase in clean coffee ratio which did not quite reach statistical significance. This suggests that extensive samplings for clean coffee ratio should be undertaken next season in view of its high economic importance.

Hulling Loss.—19.1 per cent ± 0.26. No significant differences were produced by any of the treatments.

Size of Bean.—(67.9 per cent A grade) (27.9 per cent B grade) ± 0.7.—No significant differences resulted from the main treatments, but the interaction of nitrogen on compost was significant at the 5 per cent level. This effect was parellel to that observed in the total yields.

Liquoring Quality.—The fermentation in wooden boxes produced a "foxy" raw appearance which prevented satisfactory classification. Liquors alone were therefore assessed and gave the following scores:—

Three samples were drawn from each plot of two complete replications (162 samples). To reduce the formidable volume of liquoring, only two samples from each plot were submitted, the third being held in case serious discrepancies arose between the duplicates. Each sample was scored out of ten, on a scale agreed by Mr. Devonshire, who kindly carried out the liquoring:—

Total Scores—

n_0 118	p_0 118	c_0 115
n_1 116	p_1 122	c_1 120
n_2 130	p_2 124	c_2 129

The effects of phosphates were not significant except in the presence of the 2 cwt. per acre of sulphate of ammonia, when a small improvement occurred. The overall effects of the two debes of compost and of the 2 cwt. of sulphate of ammonia, also showed small improvements in liquor classification. These results apply to unshaded coffee in the 1947 season, and need further confirmation, but they are encouraging clues in the complex problem of coffee quality.

The raw appearance, which is of dominant commercial importance, was completely unaffected by the treatments.

(*f*) *Effects on Fermentation.*—In order to avoid the difficulties found with underwater fermentation, a series of "dry" fermentations were carried out in cedarwood boxes. Preliminary samples submitted to Mr. Devonshire for liquoring and classification gave promising results, the samples being indistinguishable from those drawn from the main concrete fermenting tanks.

Subsequent experience showed two main difficulties. A marked variation in rates of fermentation, and a uniform "foxy" raw appearance which lowered the classification from 2 to 5.

Judging the rates of fermentation by the rates of rise in temperature, variations in shape and arrangement of the boxes, and in the temperature of their surroundings, were studied. Flat boxes 18 in. by 18 in. by 4 in. were compared with deep boxes giving a 9 in. cube of fermenting coffee. Coefficients of variation were 3.15 per cent and 3.80 per cent respectively, which are not significantly different. Uniformity was greatly improved by spacing the boxes separately on a stone floor. Manurial treatments affected the rate of fermentation, temperatures reached 24 hours after pulping, in 27 samples from a complete replication of the trial, are shown below:—

n_0 30.2°C.	p_0 29.8°C.	c_0 29.1°C.
n_1 30.9°C.	p_1 31.3°C.	c_1 31.0°C.
n_2 29.8°C.	p_2 29.8°C.	c_2 30.9°C.

$(p_1 - p_0)$, $(c_2 - c_0)$ and $(c_1 - c_0)$ are significant at the 5 per cent level. Thus compost, and the sodaphosphate treatment accelerated fermentation, while sulphate

of ammonia and Uganda rock phosphate did not appear to affect it. Control of the temperature of the room in which the samples were fermented at 27°C. gave most unfortunate results; the type of fermentation was affected, and all samples were sour.

Copper Injection Studies

The known effects of "tonic" copper sprays in the prevention of leaf-fall may possibly be due either to a copper nutritional deficiency or to the fungicidal effects of the sprays. The solid-injection technique, as widely practised for iron and manganese deficiencies in orchards in the United Kingdom was attempted in order to investigate this copper effect. The injections were carried out on mature single-stem coffee at the Scott Agricultural Laboratories during the long rains (May, 1947). The quantity of copper was equal to that carried in 1 pint of 1 per cent Bordeaux. Cupric oxide, cupric acetate, cupric acetate with sodium acetate, cupric tartate, cuprammonium citrate and copper sulphate were used, in an attempt to vary the degree of ionisation of the copper.

Daily, and later twice weekly, collections of fallen leaves were made, for injected trees and adjacent untreated controls. Approximate leaf-counts showed large variations, and a detailed count of all mature leaves was therefore carried out in order to express the leaf-fall as a percentage of the leaf population. Samples for leaf area were also taken.

Results.—Some leaf-fall and signs of scorching appeared in the ten days following the injection, but after ten days the rates of leaf fall, expressed as percentage of the leaf population, became identical, within the limits of experimental error, for the treated and untreated trees. The rates of leaf fall were followd for six months without detection of any significant differences. The present inference is that the tonic effects of copper sprays are not due to copper deficiency. The experiments are being extended in conjunction with fungicidal experiments by the Plant Pathologist and Physiologist, in which both copper and non-copper fungicides will be employed.

H. C. PEREIRA,
Agricultural Chemist (Coffee Services).

ANNUAL REPORT OF THE SENIOR AGRICULTURAL CHEMIST, 1947

During 1947, the Senior Agricultural Chemist, remained in charge of the cott Agricultural Laboratories and supervised the field work. There were many anges in the staff of the Chemical Section, involving three resignations, three w appointments, and one officer being transferred from the post of Laboratory ssistant to that of Agricultural Chemist (Pyrethrum). Owing to the extension of rethrum work, three extra African Laboratory Assistants were engaged and ter a few months' training, they were able to carry out certain routine laboratory ork. At the end of the year, one European and two African Laboratory ssistants were transferred to work under the Scientific Adviser to the Pyrethrum oard of Kenya.

The total number of samples dealt with in the Chemical Laboratories during e year, including those dealt with by the Soil Chemist, amounted to 1,211. wing mainly to a falling off in the number of soil samples taken and analysed connexion with Land Utilization Surveys, and no further samples being ceived in connexion with the factory preparation of dried vegetables, there as been a fall in the total number of samples dealt with as compared with the evious year, when 1,393 samples were examined. The total number of pyrethrum mples dealt with amounted to 539 which is 106 higher than for the previous ar. Owing to lower production, there was a fall-off in the number of samples alysed in connexion with export control. The greater total number quoted ove does not give a true indication of the amount of laboratory work carried t on this product as 92 samples classified under "Investigational work" involved ry detailed analytical work. A large number of locally grown foodstuffs and asses was analysed as opportunity occurred, with the result that the number foods and feeding stuffs analysed increased from 20 to 54. The special vestigation on the production of hard waxes from sisal raised the total number oils and waxes analysed from 9 to 34.

A summary of the different classes of samples dealt with, including those alysed in connexion with investigational work, is given below:—

Pyrethrum	539
Soils	464
Fertilizers	102
Feeds and plant materials	54
Oils and waxes	34
Miscellaneous	18
Total ..	1,211

Investigational Work

The main investigations carried out, apart from those in connexion with il survey, soils and fertilizers which appear in the Report of the Soil Chemist, ve been in connexion with pyrethrum work, insecticides, weedicides, and on e extraction of hard waxes from sisal waste. The latter work was carried out Mr. W. Politzer. Brief reports on insecticides and weedicides written by r. V. A. Beckley, the late Senior Agricultural Chemist, and a report on rethrum investigations written by Mr. J. Hopkins, the Agricultural Chemist yrethrum) are incorporated in this general Annual Report.

"*Pyrethrum as a Protector of Grain against Insect Attack.*—Losses due to evils and other insects are very great indeed. The F.A.O. have made a very nservative estimate that the average loss throughout the world is of the order 10 per cent. In Kenya, these losses are very much higher. In fact, samples ve been seen in which the loss was at least 90 per cent. When stored in silos is comparatively easy to protect grain by the destruction of the insects by

means of volatile fumigants. In the case of bagged grain in stacks the problem is very difficult. Fumigation is practically impossible and direct protection must be given to the grain.

D.D.T. and Gammexane do destroy weevils and so protect grain. In fact one of the best ways of disinfecting buildings of weevils is Gammexane smoke D.D.T., in order to destroy the weevils, must be used in fair quantities and so does constitute a real risk to man. Gammexane, on the other hand, is effective in very small concentrations but its use is not permitted by the Food Authorities because of possible danger.

It is accepted that pyrethrum is not toxic to man, and therefore it is a possible protectant of grain against the ravages of grain eating insects.

An experiment was therefore planned with the Entomologist to test the use of pyrethrum powder, both alone and with a carrier. Unfortunately, illness and absence on leave in the Entomological Department made it necessary for the Senior Agricultural Chemist to conduct the experiment with the aid of the junior staff of the Entomological Section. An opportunity is taken at this juncture to offer the most sincere thanks to Miss Jean Sargeant for the immense amount of work she did in making the fortnightly counts of the insect population.

In the experiment, four materials were employed namely, weevily maize, clean maize, weevily wheat and clean wheat. The so-called 'clean maize', however was not free from weevils but was very much less infested than the weevily maize. The weevily wheat was very bad and was infested by weevils, flour beetle and flour moth. The clean wheat was absolutely free of insects.

Six treatments were employed, namely:—

(1) Control;

(2) Diatomite dust at the rate of 2 lb. per bag of 200 lb.;

(3) Pyrethrum 30 per cent, Diatomite 70 per cent at the rate of 2 lb. per bag of 200 lb.;

(4) Pyrethrum 40 per cent, Diatomite 60 per cent at the rate of 2 lb. per bag of 200 lb.;

(5) Pyrethrum 50 per cent, Diatomite 50 per cent at the rate of 2 lb. per bag of 200 lb.;

(6) Pyrethrum Powder at the rate of 1 lb. per bag of 200 lb.

Each treatment was replicated four times, and the arrangement in the stack of 96 individual treatments was randomized by Dr. H. C. Pereira, to whom the writer's thanks are due. Each of the 96 samples was enclosed in a normal military sandbag, which is of a light weave and thus easily penetrated by insects.

It very soon became evident that the pyrethrum powder gave complete protection, even in the case of the weevily wheat. All insects were killed, and so were those hatching from the sub-imago stages within the grain. The clean wheat has remained absolutely free from weevils over a period of five months. Diatomite alone gave very fair protection. In every sample there were a few active weevils. Contrary to statements that have been made, it has not appreciably affected the germination of the grain. Diatomite and pyrethrum mixtures at all the strengths employed, gave good protection.

The use of pyrethrum powder at this rate has been criticized on the basis of the cost. One pound of pyrethrum powder costs approximately Sh. 1/50. A valuation made by Messrs. Unga, Limited, of samples drawn from the unprotected clean wheat and from that protected by pyrethrum were Sh. 19/37 and Sh. 32/- respectively. Was the Sh. 1/50 worth while?

Further experiments are being conducted using smaller dressings of pyrethrum powder.

V.A.B.

"*Weedicides.*—Small scale replicated experiments with the new selective weedicides have been continued at the Scott Agricultural Laboratories. Some large-scale experiments were conducted by Agricultural Officers in other districts but the reports were most discouraging. In practically every case it was stated the effects were nil. Possibly the very rapid effects of the old-fashioned weed killers were expected. With these new weedicides the effects are comparatively slow as reported in last year's report. In fact, when first used, unless observations are continued over a long period, one is most disappointed. Arrangements have been made with I.C.I. for supply of more material for larger scale experiments which it is hoped the Department will be able to conduct. Not only has Methoxone been supplied but also Chloroxone. The active agent in the first is 2 methyl–4 chloro-phenoxyacetic acid, commonly termed MCPA. In the latter, the active agent is 2, 4, dichloro-phenoxyacetic acid, popularly termed DCPA or 2, 4-D.

In the small scale experiments, a proprietary spray, containing DCPA, was found to be more effective than a MCPA spray employed at the same strength. It was thought that perhaps this greater efficacy was due to an oil in solution. The MCPA spray was, therefore, diluted with a weak soluble oil emulsion and was found to give practically the same results on dicotyledenous weeds and without any ill-effect on grass; DCPA does have a small deleterious effect on most grasses. An American powder preparation of DCPA was tested in spray form on weedy grass against MCPA. Both destroyed the majority of weeds, including that horrible pest of lawns, *Dichondra repens,* often erroneously termed in Kenya *Hydrocotyle. Oxalis* species were, however, only slightly affected and soon recovered. The MCPA spray had no ill-effect on the grass, but the DCPA spray, on the other hand, severely affected all the Kikuyu grass and, in many cases, completely killed the plants. Weed grasses, however, were stimulated.

Despite the observations recorded in last year's report, it is still believed that pyrethrum can be safely sprayed with either of these weed killers. A small experiment was laid down on a block of well established pyrethrum, in which a DCPA spay was employed at rates of one and two pounds of active agent per acre, MCPA spray at the same rates and MCPA dust at rates of two and four pounds of the active agent per acre. Both types of spray at both strengths severely affected the plants and put an end in the lower concentrations to flowering. The stronger DCPA application completely killed the plants while in the plot receiving the stronger MCPA spray, over 90 per cent were killed. Incidentally, the stronger spray of DCPA completely destroyed Purslane (*Portulaca oderacea*). Dusts at all strengths had little or no effect; possibly this was due to the weather conditions at the time of application.

V.A.B."

"*Fumigant effect by Gammexane.*—The suggestion made in last year's Annual Report that Gammexane can act at a distance as a fumigant, has been confirmed. Again mustard was the crop employed, but this year, in order to prevent any effect on the treated plots from the untreated, control plots were planted some distance away from the treated. These plots were completely destroyed by the sawfly that attacks *Brassicas.*

The treated plots received a dressing of 5 per cent BHC dust at the rate of 40 lb per acre at the time of sowing, in order to protect the seedlings against the beetle. The first plot received another dusting three weeks later, and again after three weeks. It was intended that the second plot should be separated from the first by a wide untreated strip; unfortunately, owing to an error, this untreated strip was missed. This plot received two dressings at four-weekly intervals. The third treated plot, which was now divided from the other two by a very wide untreated strip, received two dressings, the first three weeks after sowing and the second six weeks after that. The treated plots were virtually unattacked

by sawfly even though the dust had been washed off the plants. The untreated strip between the second and third plots was severely damaged, the damage increasing the further away the plants were from the dusted plots.

There can be no doubt whatsoever, both from the protection afforded and the behaviour of the sawflies, that the Gammexane had a marked fumigant effect.

V.A.B."

Hard Waxes from Sisal Waste.—Investigation dealing with the extraction of hard waxes from sisal waste showed that fresh sisal leaf contained about 0.7 per cent of cuticle material which, when extracted with toluene, yielded about 17 per cent of a light, greyish-yellow waxy material, the greater portion of which separated out on the cooling of the solvent. In practice, cuticle-rich material resulting from the carding of flume tow could be retted to yield a product with a high proportion of resistant waxes. It is estimated that the equivalent of 1 to 1½ parts of waxes could be obtained from each 1,000 parts of fresh leaves decorticated. It is suggested that benzene would be the most suitable solvent for large scale extraction. An account of this work has been submitted to the Journal of the Society of Chemical Industry for publication.

Essential Oils.—At the request of the Forestry Department, distillations were made on prunings from Cyprus plantations at Lari, Londiani and Nyeri. From the prunings from Lari, the yield of 0.4 per cent of an oil having a sweet, lemony odour combined with a balsamic odour, was obtained. That from Nyeri gave a yield of 0.32 per cent of an oil with a very pleasant balsamic odour. From the Londiani prunings the yield was very much less, only 0.17 per cent, and distillation was slow. This oil had a balsamic odour. Samples of all the oils have been sent to the Imperial Institute for examination and valuation.

The Colonial Research Council asked for supplies of certain drug-containing indigenous plant materials. Dried leaves of *Catha edulis* (Miraa), dried flowers of *Brayera anthelmintice* (Hagenia), and fruits of *Myrsine africanum* were obtained from different sources and dispatched to Professor J. L. Simonsen of the Imperial Institute.

Field Work

Mr. W. H. Hewitt, the Assistant Agricultural Officer stationed at the Laboratories, has remained in charge of field work and there has been an extension in the planting of special experimental crops. The long rains in 1947 were heavy and prolonged, amounting to 25 inches from the start of the fourth week in March to the end of the first week in June. These were followed by a long drought up to early November. The short rains almost failed, the total fall being some 2½ inches only. The year's rainfall of nearly 44 inches was some 7 inches more than the average for the past 23 years since rainfall recording started. The long rains plantings did well, whereas plantings at the start of the abortive short rains failed due to extreme drought conditions. Some important wheat and potato trials were maintained by watering.

Cereals.—As it had been noted that the original strain of Muratha maize was deteriorating, all vacant land was planted with this crop for the purpose of selection work. The Senior Plant Breeder supervised the selection of seed cobs based on good size, good cover towards the tips, medium height on the stalk and a more horizontal or drooping tendency of the cobs. Some of these desired characteristics would be expected to lessen the soaking in of rain before harvest. After screening, further selection was made, choosing straight, shallow, flinty corn. This work is being continued.

The five varieties of hybrid maize planted towards the end of 1946 short rains were harvested in the latter part of March, 1947. The varieties Pontiac,

and Stowell's Evergreen, both harvested after 127 days, were failures. The plants were 3 to 3½ feet high and carried small cobs with only a few seeds. Texas yellow hybrid No. 10 plants were about 5 feet tall with some one dozen leaves per plant, and carried two, and sometimes three, cobs, each with 5 to 6 ounces of grain. Texas white hybrid No. 9, and Texas yellow hybrid No. 12, maturing in 140 days, were 6 to 7 feet high with about a dozen leaves. The former was badly subjected to white blight, leaf rust, and fusarium, but most plants carried two cobs, each bearing 4 to 6 ounces of grain. Texas yellow hybrid No. 12 appeared to make vigorous growth and was more free from disease and usually carried two, though occasionally one, cobs per plant, each cob yielding 10 to 12 ounces of flat, dented corn. The same five varieties of hybrid maize, using fresh seed from Njoro, were again planted in the long rains of 1947. Again, Stowell's Evergreen was a failure and Pontiac did badly. Nos. 9 and 10 did fairly well and Texas yellow hybrids Nos. 10 and 12 were again the best of this series.

Selection work with wheat against rust has been continued and eight selected crosses were planted out for multiplication purposes. Such seed sown in the good long rains did well but the subsequent short rains sowings failed due to severe drought.

Mustard.—Field trials with yellow and black mustard sown in widely separated plots were continued and treated with Gammexane dust of a strength up to 5 per cent. The plants receiving the heaviest dustings at sowing, after three weeks, and after six weeks, were not attacked by flea beetle and sawfly, but increasing damage was noted when less drastic dusting treatments were used. Without dusting, both crops were failures. Black mustard made a much more vigorous growth than the yellow variety. It attained a height of about 9 feet and had larger heads which yielded more seed. Black mustard was also more resistant to damage by insects and the seed was less favoured by birds. The heavy, prolonged rains during the growing season of 1947 resulted in an infestation of mildew in the case of the black mustard but this did not appear to have much effect on growth and yield. Mustard seed was eagerly sought by birds and there was a considerable, but unknown, loss of seed and hence reliable yields of seed per acre could not be taken.

Beans.—Eighteen varieties of beans obtained from Uganda were planted in the long rains and a selection of nine of these were used for further trials in the following short rains. They were compared with Canadian Wonder, Plentiful, Rose Coco, and Grenada. All the plots were randomised. Unfortunately, all the varieties failed due to drought. In other trials, new strains of beans and peas and so-called "pea beans", received from the United Kingdom, did not do as well as the local varieties of haricot beans and peas. These trials will be continued in 1948.

Miscellaneous.—Further plantings were made of twelve varieties of reported blight-immune potatoes from America. The second and third crops, including one lot grown in a wet season, showed no signs of blight. Two further lots received from the United Kingdom, were grown during the short rains and had to be watered. They produced a small crop from which selections will be planted in 1948.

Safflower, which had done well in 1946, was again planted for multiplication purposes and seed has been distributed. The second crop was poor, yielding only 240 lb. of seed as compared with 1,700 lb. per acre in the previous year.

Coriander was planted again in 1947 and grew well, yielding some 660 lb. of seed per acre, as compared with 580 lb. in the previous year.

Dill planted in the long rains developed a fungus and failed to set seed. It will be tried again in fresh ground.

Caraway obtained from Cyprus, and also an annual strain developed in the United Kingdom, were planted and again failed under our local conditions.

Selection work for a high nicotine content tobacco has been continued. Leaves from several characteristic plants were analysed and selections made from a good type, yielding over 13 per cent nicotine.

As Kudzu vine has not been a success, some seed of *Pueraria phaseolides*, which grows well in parts of Western Australia, where Kudzu does badly, has also been sown, Also some Poona pea from the same source.

A small bed of Camomile has been established and some plants have been distributed.

Some two-thirds of an acre has been planted with passion fruit on behalf of the Senior Plant Pathologist.

A further 3½ acres of old coffee land have been cleared and planted to the Nzoia strain of Rhodes Grass for the purpose of providing seed for distribution. The remaining coffee has been maintained and selected seed and suckers have been handed over to the Coffee Team for distribution.

A report on analyses carried out in connexion with export control of pyrethrum and also certain investigational work has been prepared by the Agricultural Chemist ,Pyrethrum) and is added to this general report of the Senior Agricultural Chemist.

G. H. GETHIN JONES,
Acting Senior Agricultural Chemist.

REPORT BY THE AGRICULTURAL CHEMIST (PYRETHRUM), 1947

The following changes in the staff of the Pyrethrum Section have taken place during the year:—

J. Hopkins, M.P.S., was appointed Agricultural Chemist (Pyrethrum) on the 1st January, 1947.

B. A. Wyndham, Junior Laboratory Assistant, resigned on the 10th March, 1947.

P. M. F. L. Lalanne, Junior Laboratory Assistant, resigned on the 31st March, 1947.

Miss E. Bailey was appointed Junior Laboratory Assistant on the 1st September, 1947.

Miss E. C. Garrod was appointed Junior Laboratory Assistant on the 15th September, 1947.

Miss E. C. Garrod resigned to join the staff of the Pyrethrum Board on the 31st December, 1947.

Three more African Laboratory Assistants were engaged against the additional vote, resulting from the increased contribution of the Pyrethrum Board. These Africans after a few months training, are proving themselves capable of carrying out routine operations in analysis to a very satisfactory standard of accuracy. This has made it possible for more investigational work to be undertaken by the European staff than has hitherto been possible.

Two African Laboratory Assistants, who had been on the staff since 1946, transferred to the Pyrethrum Board on the 31st December, 1947.

Work Done

The number of samples dealt with is summarized in tabular form below:—

Nature of Sample	Outstanding at 31–12–46	Received	Refused	Analysed	Outstanding at 31–12–47
Control ..	71	175	—	230	16
Breeding ..	—	216	—	165	51
Investigation ..	—	98	—	92	6
Miscellaneous ..	—	52	—	52	—
TOTAL	71	541	—	539	73

This represents a net increase in the total number of samples analysed of 106 over 1946, but the table does not give a true indication of the work done as many of the samples dealt with, notably those in connexion with the investigational work, have necessitated a very large number of analyses being carried out on a comparatively small number of samples. In one of the experiments later referred to some 240 complete analyses had to be made.

Export Control

Although the total number of samples received has increased, there has been a falling off in the number of Control samples, 327 of these being received in 1946 and only 175 during 1947.

The method of analysis used for the control has remained that of Seil throughout the year. Little progress can be reported towards final agreement on methods of analysis on both sides of the Atlantic. Although the Mercury Reduction Method is adopted by the Association of Official Agricultural Chemists for the enforcement of the Insecticide Act of the U.S.A., the National Association of Insecticide and Disinfectant Manufacturers of the U.S.A., use the Seil method for the assay of Pyrethrum and its products.

A world wide scheme of collaborative work to study the several methods of analysis in use was initiated some time ago by the Imperial Institute and it was hoped that, as a result of this, one method would be adopted as standard throughout the world. It is disappointing to report that this scheme has not yet been put into operation.

Breeding Work

One hundred and sixty-five breeding samples out of a total of 216 submitted by the Senior Plant Breeder have been analysed. The position regarding the supply of apparatus is still critical and this, combined with the importance attached to certain investigational work undertaken at the request of the Pyrethrum Board has made it impossible for more breeding work to be carried out.

Investigational Work

(*a*) A long-term experiment, designed by Mr. V. A. Beckley at the request of the Pyrethrum Board, to determine the losses in the toxic content of baled pyrethrum flowers after various periods of storage was commenced in June. The experiment has yet to be completed but it appears from figures so far obtained that the true pyrethrum content of aged material cannot be assayed accurately by either of the two chemical methods of analysis in common use, as the apparent deterioration even after four months' storage was not as great as has been estimated in the past. It is suggested that oxidized pyrethrins or other decomposition products of the original pyrethrins are not removed by the processes of extraction and purification used in the Seil Method or the Mercury Reduction (A.O.A.C.) Method and further, that these substances are capable of behaving as pyrethrins and showing as such in the final result of the assay, thereby considerably reducing the apparent loss and correspondingly increasing the apparent amount of pyrethrins remaining.

(*b*) Some work was also done on the use of anti-oxidants applied to baled pyrethrum flowers in the form of aqueous spray, as a preservative during storage. The experiment gave very encouraging results over periods up to four months. The following figures are based on the analysis of two bales prepared from similar material on the same day and stored under identical conditions for four months:—

Material	Depreciation after Four Months			Per Cent Depreciation on Original Pyrethrins
	Py.I	Py.II	Total	
	Per Cent.	*Per Cent.*	*Per Cent.*	*Per Cent.*
Plain Bale ..	·26	·14	·40	20·6
	·23	·16	·39	20·1
Sprayed Bale ..	·17	·11	·28	14·9
	·15	·08	·23	12·2

Even allowing for the fact that the actual depreciation may be greater than as shown (*vide* para. (*a*) above)—the difference in depreciation between the sprayed and the unsprayed bales is appreciable as analysis of both bales, after storage, was carried out by identical methods and at the same time.

(*c*) The suggestion was put forward that as about 90 per cent of the total yrethrins present in the flower head are concentrated in the achenes, a more onomical method of export could be developed by separating the achenes from e rest of the flower and baling and exporting the former. Accordingly, an vestigation into the depreciation of the pyrethrins in baled achenes was under-ken. A quantity of flowers was put through a seed cleaning machine and alyses made of the achenes thus produced. In the case of the sample used it was und that the pyrethrins in the achenes amounted to only 73.1 per cent of the tal pyrethrins present in the whole flowers from which they were separated. ne achenes were then baled in a small press and stored for three months after nich analyses were again carried out. The rate of depreciation was found to very small, though tending to be greater than in whole flowers treated in similar way.

As the results of this preliminary investigation were somewhat inconclusive, rther work involving the storage of pyrethrum achenes under very carefully ntrolled conditions for longer periods is being carried out.

J. HOPKINS,
Agricultural Chemist (*Pyrethrum*).

ANNUAL REPORT OF THE SOIL CHEMIST, 1947

There were no changes in staff during the year. This has remained one Soil Chemist, one Assistant Chemist and one African Laboratory Assistant. During the year, at total of 464 samples of soils, 102 fertilizers and 20 miscellaneous materials were dealt with. The fall in the total number of soil samples examined from 662 in the previous year was due to many less samples being taken and examined in connexion with land utilization surveys. Of the above total of 464 soil samples, 84 were taken and submitted by Agricultural Officers for their own information or on behalf of farmers, and 240 samples weer submitted direct by farmers, thus making a total of 324 soil samples examined and reported upon in connexion with advisory services. The amount of laboratory work involved with this aspect of the duties of the Soil Chemist has now become considerable. It would save correspondence and the Soil Chemist could be more helpful if farmers supplied more representative composite soil samples and gave some account of the land in question, giving information about the manner and depth of sampling, the history of crop performance and past manuring, if any, and which crops are now to be grown, whether improved grazing, cereals, pyrethrum, or perhaps some permanent deep-rooting crop such as tea, coffee or fruit. In the latter case, there is also need to take subsoil samples. An examination of the soil samples received shows an increase to 33 samples being received in connexion with the selection of potential tea soils in the Sotik, Kericho, Nandi and Kaimosi areas. Many of the soils from the Nandi district were found to be highly suitable for tea growing. Twenty-eight of the soil samples examined were in connexion with the choice of land for the large-scale growing of pineapples, mainly in the Teita district. There has also been an increase in the number received from potential fruit growers.

The 102 samples of manures and fertilizers analysed were mainly made up of samples of silicophosphate or soda phosphate prepared by farmers and samples used in investigational work with this local product at these Laboratories. There were also the control analyses of imported Seychelles phosphate, double and triple superphosphate and a few nitrogenous fertilizers. Most samples of compost submitted were again found to be very earthy. The amount of added soil or that carried into the compost by white ants often amounted to some two-thirds of the dry weight of the compost, with the result that the nutrient content of the material was low and heavy dressings per acre have to be advised. There has been a diminution in the number of limestone and lime products examined.

Investigational Work

Investigational work with soils and fertilzers carried out during the year cannot be conveniently classed under particular crop headings as the work deals with particular soil types and their treatment. In general, most of the work on the use of soda phosphate and its reactions and availability in different soils has, up to the present, had special application to cereal growing. By far the greater amount of imported phosphates, amounting to the equivalent of some 1,500 short tons of phosphoric oxide, are used with this type of crop.

Soil Survey.—Field work over some one thousand square miles carried out in connexion with the Tana River Irrigation Project, though undertaken from a land utilization point of view, enabled the writer to collect much pedological data on the morphology and the distribution of natural Soil Series and Soil Fascs in an out of the way semi-desert region. The examination of 93 prepared trial pits varying in depth from two feet, where massive secondary limestone was met, up to twelve feet in soft, unconsolidated deposits gave much useful information on the manner of soil weathering and the soil formations produced from different lithological materials under varying conditions of topography and drainage under arid conditions. The soil conditions observed enabled one to add eight new Soil Series and four new Soil Fascs to the System of Soil Classification now being

built up. Furthermore, characteristic Soil Catenæ based on varied topography and drainage have been noted, the component parts of one recurring catenary complex ranging from Red Desert Sands over massive secondary limestone to dark grey, very impervious sandy clays that lose all cohesion on wetting. The adoption of Soil Catenæ to describe and to map recurring patterns of soil conditions has special application in these extensive undeveloped regions. During survey work in the coastal region, carried out in connexion with development projects, records were taken of the lateritic weathering of Pleistocene white clayey sands and the formation of dark-coloured, tropical calomorphic soils from calcareous shales.

Land Utilization Surveys.—A reconnaissance soil survey of the Shimba Hills, near Mombasa, was carried out to study the suitability of this site for a long-term afforestation project, coupled with the growth of bananas for the large-scale production of banana flour. Over most of the area, there is a good depth of a naturally well-drained, moderately acid, reddish-brown to reddish-fawn clayey sand to sandy loam with fair to good amounts of organic matter and plant nutrients derived *in situ* from coarse-grained Shimba Grits. The virgin vegetation is patchy rain forest and grassland and, up to the present, there has been little soil reassortment and no surface erosion or gulley formation. It is likely that nearly all the rainfall received enters the porous, light-textured soils. The main question that governs the general feasibility of this project is the likely effect which it would have on the water supply for Mombasa. There is need to consider the possible adverse effect of replacing the present, mainly grass, cover by a three-canopy mixed vegetation cover of mvuli, banana and a ground cover on the net amount of water that will drain through the soil. At present, the normal flow of the springs suggests that most of the rainfall received is evaporated from the soil and through the vegetation and that only a low proportion feeds the springs. Thus a possible small increase on the amount of water lost would be likely to bring about a marked reduction in the normal flow of the springs. If it is ruled that the project would not endanger the water supply or that planting be done off the water supply catchment area, then there will be need to shade the land and to grow some leguminous cover crops during the early years as, with cultivation and cropping there would be a rapid destruction of organic matter with the loss of nitrogen and other nutrients which, at present, are held in rapid circulation between the vegetation and the virgin soil.

A soil survey of the suggested Kwale Road site for a Coastal Experimental Station showed this to be highly suitable for this purpose. There are varying depths of brownish to reddish sandy soils derived from the coastal Pleistocene white clayey sands, dark heavy soils over calcareous shales and a wide range of reassorted soils and swamp soils which are representative of the coastal region. This area also has a suitable supply of spring water and a very suitable site for a dam, such that the growth of crops under irrigation on the heavier soils could be carried out.

Some further survey work was done in connexion with the Makueni Settlement Scheme and the potentiality of the Southern Chyulu Hills and parts of the Athi Plains for African Settlement.

Tana River Irrigation Project.—In the previous annual report an account was given of a reconnaissance soil survey over some 4,000 square miles in the Upper Tana Basin and showed that sufficient land with a suitable topography and depth of soil for irrigation only occurred on the peneplain off the left bank of the river from about opposite Rahole to opposite Garissa. In 1947, a further more intensive field survey was done over this potential site of some 900 square miles. Over 100 soil trial pits were examined and profile soil samples were taken from 30 representative pits for analysis as to the suitability of the different soils for cropping under irrigation. The properties and the general distribution of five main soil types over this area have been noted. Particular attention was paid

to the selection of a site for the proposed Irrigation Experimental Station so as to obtain sound information on the relative suitability of the most promising soil types, the degree of improvement in crop production that can be brought about by good soil management and the drainage needs of some of the heavier impervious soils. This information is necessary so that one can assess the feasibility, or otherwise, of a necessarily very expensive major irrigation scheme in a region distant from the channel intake and with definitely marginal soil conditions.

The selected site which has several main soil types fairly close together is situated just above the belt of "bad lands" about twelve miles north-east of Saka. The main cost in connexion with this proposed experimental station would be the providing of means for pumping, piping, storing and the distribution of water to the selected somewhat dispersed experimental plots and the provision of experimental drains. The cost for such works will be prepared by the Public Works Department. Provisional estimates of the initial capital outlay of the proposed experimental station, apart from the engineering works referred to, have been prepared. These amount to some £8,000.

Further pot culture work has been done with different representative soil samples from the proposed site. The results obtained confirmed last year's trials that, in the case of these semi-desert soils, there is a definite need to build up their fertility. There are indications that this can be done by raising the humus status of these soils and the nitrate supply by appropriate cultural methods only without the use of imported fertilizers.

Soil Structure.—A suitable technique is being worked out to assess soil crumb structure. Many measurements of the aggregation of the soil particles into granules or crumbs by a wet sieving technique have been made, more especially to compare the structure of the same soil type following different treatments. There is need to distinguish between the desirable porous, rounded aggregates which are built up under a vegetal cover, more especially turf, and which are destroyed by cultivation and cropping, from the compact, fragmental particles or "clods" with well-defined faces and edges. Any method of assessing crumb structure must be arbitrary. It has been found that the method of taking a sample, its moisture content, the time of storage, the manner in which the bulk field sample is prepared to give a standard sample and, of course, the technique of wet sieving greatly affect the values obtained. Both the air drying of the field sample and also wetting previous to sieving which causes a slight shattering decrease the percentage of the larger aggregates.

In the case of four samples kept air-dry for twelve months and again wet-sieved in a similar manner, the amount held on the ½ mm. sieve was, in each case, only about two-thirds of that found in the previous determinations. The mesh of the last sieve used in preparing the standard sample greatly affects the results obtained. Thus, in the case of three bulk samples, the use of a 2 mm. sieve as compared with a 5 mm. sieve gave much lower values. The amount held on a 1 mm. sieve is thus usually about halved, and that held on a ½ mm. sieve is only some two-thirds or less. Furthermore, it has been found that values for soil aggregation can only be compared within similar soil types containing not dissimilar amounts of the finer ultimate particles.

In the technique now being adopted, not less than 5,000 grams of a partially air-dried representative bulk sample is gently passed through a half-inch sieve and a quartered composite sample of not less than 1,000 grams is then similarly passed through a 5 mm. sieve. The initial partial drying of a moist bulk sample has to be done slowly indoors and the final air-drying completed after using the 5 mm. mesh sieve. Following standardized wet-sieving and the weighing of the air-dry fractions, the portions on the different sieves are then rubbed through and the amounts of residual sand, grit or hard laterite particles are deducted

m individual original aggregate weights. This treatment gives a much more iable value for aggregates of the finer particles in the case of soils containing gle grain coarse particles. In the case of sand-free soils, usually less than per cent of the gross aggregate weight has to be deducted, whereas with less ely homogenous soils, more especially those containing much sand, the solid idual matter is often very high and may amount to 70 or 80 per cent of the ss weight of the coarser aggregates. In cases where land has only recently been ared of mixed vegetation, there are marked differences in the values obtained soil aggregates within a small area and there is need for replicated sampling d aggregate analysis. When land is subjected to different cultural treatments re is need to mark the sites where the original soil samples were taken and to eat the sampling near the previous sampling sites. As different kinds of soils ve different types of distribution curves for aggregates, the effects of treatnts on soil structure cannot be assessed by comparing the amount of soil mbs held on a sieve of a particular mesh, such as the $\frac{1}{2}$ mm. sieve. It must read from the nature of the distribution curve as a whole.

The Manufacture of Silicophosphate.—In the 1946 annual report a detailed count was given of certain difficulties and laboratory findings relating to the all scale production of silicophosphate or soda phosphate in kilns. In the meane, many keen individual farmers, more especially on the Plateau, attempted augment their limited allocation of imported phosphates by starting trial thods of preparing silicophosphate in small kilns of various designs on their ms. In February the Fertilizer Sub-Committee of the Agricultural Produc- n and Settlement Board recommended that £500 out of the sum available for sidizing fertilizers should be allotted to the Soil Chemist for necessary experintal work on a practical method for preparing this now proved phosphatic tilizer on farms. Early kiln trials under the supervision of Mr. Grundy, the sistant Chemist, were started at Kitale, where there were certain facilities for s work and further investigations on the most suitable design of a kiln and its eration were continued at the Scott Agricultural Laboratories. The actual cost the investigation which made it possible to recommend a particular design kiln, with details about methods of mixing, moulding, air-drying and the stack- and firing of the kiln, amounted to £200.

There are certain inherent practical difficulties in firing units made of mixes containing crystals of sodium carbonate. The made brick contains little or collodial materials that help setting on air-drying and the cohesion that is ained is due to the binding of the brick by water-containing crystals of soda. gently heating, these crystals melt and the mass loses its original good esion and there is a stage when the brick becomes pasty before it acquires ew kind of cohesion due to further firing. Unfired bricks also contain some e water, more especially in damp weather or if they have only recently been de. Both this water and the water of crystallization have to be driven off ing the early stages of firing thus giving a high humidity, so precautions must taken such that the very humid warm gases do not cause excessive condensan, and hence the softening and collapse of bricks further away from the rce of heat. This has been the main trouble experienced by farmers.

Observations were made on the efficiency and the nature of the total burn ained with a succession of small, wood-fired kilns of about one ton capaciy l alterations in design were incorporated as found necessary. The essentials the final design which was found to be satisfactory were that it must be tively shallow and narrow with a firebox extending for at least two-thirds the gth of the kiln and with a forward extension or vestibule to preheat the gases as to ensure the proper firing of the front portion of the kiln load. It was nd necessary to have two chimneys situated at distant ends of the kiln so t an upward flow of hot gases through the kiln could be gradually extended kwards by adjusting the draught through the two chimneys. Between the two

chimneys a metal sheet or lid covers the top of the kiln to serve as an adequate opening for stacking and emptying. It was found that the greater mass of the kiln load has to be maintained at red-hot heat, with the top layer but one dull red, for some five hours, giving a total period of some ten hours of total firing. The bottom layer above the firebox will be slightly sintered, whereas the top layer of bricks will remain underfired and will have to be burnt again. It was found that it becomes economically impossible to attempt to prepare silicophosphates with a very high average degree of conversion into the citric-soluble form in small, single-chamber farm kilns. It is suggested that farmers should aim at a mean conversion of about 80 per cent only.

The making of silicophosphate or soda phosphate on farms enables keen individual farmers to augment their limited allocation of imported phosphates so that they can be sure of a sufficient supply to meet all their requirements. However, when it will be possible to purchase a guaranteed high-quality silicophosphate, prepared under properly controlled conditions, most farmers will probably be glad to purchase rather than to prepare their requirements. In the meantime the preparation of silicophosphate or soda phosphate on farms can make good the present deficiency of suitable phosphatic fertilizers and can help to maintain yields on lands which are known to require this class of fertilizer.

A detailed account of the full process with a diagram showing the design of the kiln was published in the January, 1948, issue of the *East African Agricultural Journal.*

As there was need to know whether Uganda rock phosphate containing different proportions of certain phosphate-containing minerals might vary in their reaction on calcining with Magadi soda, two samples of ore with a very high content of apatite were obtained from the Director of Geological Survey, Uganda, for experimental calcination tests with Magadi soda. Standard calcining of the two samples containing 40 per cent and 35 per cent of total P_2O_5 and with .8 per cent and .2 per cent only, respectively, of citric-soluble P_2O_5 gave products with 22 per cent and 20 per cent of citric-soluble P_2O_5. These first tests indicated that even with apatite-rich ore, the degree of conversion approached the normal for mixed ores.

G. H. GETHIN JONES,
Soil Chemist

ANNUAL REPORT OF THE SENIOR ENTOMOLOGIST, 1947

Staff

Dr. R. Le Pelley, Senior Entomologist, was on duty in the Colony until
1 April, when he left on duty and leave for the United Kingdom. He returned
the Colony on 12th December.

Mr. C. F. Fox was on duty until 1st September; from then until the end
the year, he was absent through illness.

Miss Jean Sergeant joined the section as Junior Laboratory Assistant on
March and was on duty until the end of the year.

During Mr. Fox's absence, through illness, the following officers helped from
e to time with the work of the section, and I wish to acknowledge with thanks,
valuable assistance thus rendered: Mr. R. W. Rayner, Mr. F. G. G. Peake
the Forest Department, Mr. P. R. Stephenson, Mr. J. F. Graham and Dr. R.
J. Gascoigne.

Plant Protection

The only new legislation under the Plant Protection Ordinance was in
nexion with maize stalk borer, and will be mentioned under that heading.

The work of operating this Ordinance still continued to increase, as indicated
the fact that 700 plant importation permits were issued. The bulk of the plant
erial imported was inspected at Mombasa by the Chief Grader and Inspector,
a large number of parcels of plants and seeds received by parcel post and
freight were inspected in Nairobi.

The negotiations in connexion with the possibility of importation through
ganyika into Kenya of plant products from outside East Africa, were
sfactorily concluded, and we were informed that the General Manager,
ganyika Railways, had issued departmental instructions intended to prevent
1 a possibility.

The prohibition of the importation of herbaceous ornamental plants in a
ative condition was continued throughout the year. During the year, however,
were informed that the tomato spotted wilt had been found in Tanganyika
ritory, and the ban on importation of such plants had therefore to be
nded to include that country.

The export of plants to those parts of Tanganyika in which the coffee mealy
Pseudococcus kenyae does not occur, for which it was thought arrangements
been made, subject to certification by this department that they had been
ably fumigated, was only in part allowed by the Tanganyika authorities. At
sent it appears that they are prepared to allow importation (subject to the
e of permit from the Tanganyika Department of Agriculture) of plants from
as in Kenya outside the area infested with the mealy bug.

There was an increase in the number of packages of plants examined for
ort from the Colony. One hundred and one export certificates were issued.

General Advisory Work

One hundred and thirty-three items, either insect pests or infested plant
erial were examined and reported on at the laboratory. A large number of
tors seeking advice on insect control, visited the laboratory.

Maize Stalk Borer

Legislation.—There was a considerable increase in infestation of the stalk
er (*Busseola fusca*) during the year, especially in the Trans Nzoia, Uasin
au and Nakuru districts and legislation was again introduced prohibiting

maize planting between certain dates in order to ensure a close season, and this action was extended to cover a wider area than in 1946. In addition, the burning of maize and sorghum residues was made compulsory.

These measures were ordered in Government Notices 1164 of 6th December, 1165 of 6th December, and 1166 of 25th November. The result should be a decrease in maize stalk borer in 1948.

Control Measures.—Further trials of a dust consisting of D.D.T. 1 part, local Diatomite 99 parts were carried out and successful results were again obtained.

Chafer Grub

Further field trials with B.H.C. were carried out at Kitale against the chafer grub (*Schizonycha* sp.) in the Trans Nzoia. In the conditions in the field, it has been found that a heavy dosage is necessary to achieve an appreciable mortality of the grubs. It is not concluded finally that B.H.C. will not prove satisfactory to control this insect, but it is clear that advance on this problem now requires specialist work over a considerable period.

Sisal Weevil

The first record of this pest (*Scyphophorus acupunctatus*) in Kenya occurred this year, where a fairly large area of sisal was found to be infested at Mwatati. Subsequent examination of the position indicated that the insect had probably been present for some considerable time before it was first reported.

Other Insect Records

A species of Dynastid beetle (*Heteronychus* sp.) which may be called the Black Maize beetle, did considerable damage on maize and potatoes in the Ol Joro Orok area.

Larvæ of a Buprestid beetle were reported boring in wattle trees in the Turbo area. The insect appears capable of doing considerable damage, and is still under investigation.

Considerable damage has been caused to maize and wheat over limited areas by larvæ of the Pyralid *Marasmia trapezalis* Guen.

The Lagriid beetle *Lagria villosa Fabr.* was reported eating pyrethrum buds at Londiani.

A species of Ptinid beetle *Gibbium*, probably *psylloides* Czemp, was reported apparently for the first time in Kenya, as a household pest. A severe infestation did damage to leather goods and clothing in Rongai.

In conclusion, I wish to acknowledge the help of the Imperial Institute of Entomology, particularly in connexion with the identification of insects.

R. LE PELLEY,
Senior Entomologist

ANNUAL REPORT OF THE SENIOR PLANT PATHOLOGIST, 1947

I was absent from Kenya, on overseas leave, from the 3rd July until the end of the year. During this period, Mr. R. W. Rayner took over the duties of Senior Plant Pathologist.

While in the United Kingdom, I spent two days each at the Research Stations at East Malling and Long Ashton. Two days were also spent at the Official Seed Testing Station, Cambridge, and visits were paid to the Commonwealth Mycological Institute, Rothamsted Experimental Station, Commonwealth Bureau of Plant Breeding and Genetics and the Ministry of Agriculture's Plant Pathological Laboratory at Harpenden. I also called on manufacturers of spraying machinery and glass houses in Maidstone, Ipswich and Wisbech.

Seed Testing

The seed testing laboratory continues as part of the Plant Pathological Section.

During the year, 304 samples were tested in the laboratory, approximately the same number as in the previous year. The samples consisted, in the main, of Rhodes Grass (*Chloris gayana*) and *Bromus marginatus,* vegetable and flower seeds. These were, for the most part, departmental samples and a few from the Kenya Farmers' Association. None was submitted from the general public.

Purity analysis were made of a number of samples of pyrethrum seed which had been passed through various sieves and blowers. Experiments were carried out on the germination of the seed at temperatures of 15° C., 22° C., 25° C. and 30° C. There appeared to be no significant difference in the percentage germination of the seed at the different temperatures.

Work in connexion with the economic herbarium and seed collection was continued. Much of the earlier collection has been worked over and remounted.

The considerable introductions of seed from abroad are not dealt with by this Section.

Wheat Stem Rust

The number of physoiologic forms of the wheat stem rust so far encountered and isolated remains at seven. These have been maintained in culture throughout the year with the exception of the form K.5, which was lost early in the year. This form was subsequently recovered from a natural infection of wheat No. 58 which occurred in the artificial field epidemic at the Scott Agricultural Laboratories. The maintenance of healthy wheat plants in the cages and consequently the production of abundant rust was again found to be extremely difficult. The cause is obscure but aphids and red spider are partly responsible. It is doubtful if complete success will be achieved until some form of temperature and humidity control is established. The trouble is partly overcome by the injection of mature plant technique. Dynone dust is now being used in an attempt to control the Red Spider.

In view of the almost continuous difficulties experienced and the risk of losing one or other of the physiologic forms, a duplicate station has been established at the Plant Breeding Station at Njoro, under the supervision of the Senior Plant Breeder. It is likely that the climate at Njoro will prove to be more suitable for the maintenance of healthy wheat plants and rust cultures than is at present being experienced at the Scott Agricultural Laboratories. The duplicate station has already proved its value in that the form K.3, which died out at the Scott Agricultural Laboratories, was maintained at Njoro and from there re-established at Nairobi.

A number of samples of stem rust collected in the field were identified by their reactions on the differential wheat varieties. The predominant forms were K.3 and K.7.

Twenty-three new wheat hybrids were tested for resistance to the seven physiologic forms by inoculation in the seedling stage.

The annual artificial field epidemic in which the Senior Plant Breeder's hybrids are subjected to a further test was successfully carried out.

Potatoes

The multiplication and distribution of the blight resistant potatoes has continued. The earlier introductions have been grown by farmers under an agreement with the Department, whereby 25 per cent of the crop is returned to the Department free, which also has an option to purchase any of the crop in excess of this which the grower does not himself wish to use for seed. Eight farmers took part in the scheme which was organized by the Senior Agricultural Officer, Rumuruti.

The 914 series has proved up-to-date to be the most popular. The demand for seed of this and other blight-resistant varieties, has greatly exceeded the supply. During the year, a number of reports was received that one or other of the blight-resistant varieties had been attacked by blight. In no case was this claim substantiated. The symptoms, where it was possible to examine material, proved to be those of either *Alternaria solani* disease or necrotic lesions from virus disease.

The varieties grown under contract by farmers as above, were 914 a 91, 835 a (4), Salaman Clarke 2 and Dutch Robyjin. Dutch Robyjin proved to be highly resistant but not immune. In spite of this, it is a comparatively heavy cropper and continues to be popular.

During the year a further supply of 40 lb. of 914 a 91 was received from the Scottish Society for Plant Breeding through the courtesy of Dr. Black. Six hundred-weights of the variety, Salaman Clarke 2 were obtained direct from Mr. Clarke of Ballycastle, Northern Ireland. These two consignments were sent direct to the Agricultural Experimental Station, Ol Joro Orok, where the chances of the stocks becoming infected with virus disease are considerably less than at the Scott Agricultural Laboratories.

There is still no evidence of the occurrence of any newly evolved strain of blight. It would appear that blight in Kenya is either strain "A" or "C" or both, as heretofore.

Pyrethrum

The prethrum bud disease associated with *Ramularia bellunensis* Speg. first recorded in 1946, has been equally widespread during the year but with considerably less intensity. Material for identification has been received from as far away from the original outbreak as Mount Elgon and the Belgian Congo. Successful inoculations with the fungus have not, so far, been achieved.

Forest Pathology

A certain amount of material for identification and advice has been received from the Forest Department consisting of specimens of root rot of timber trees, damping off of seedlings and timber decay.

The canker disease of *Cupressus macrocarpa* caused by *Monochætia unicornis* (Cooke and Ellis) Sacc. continues to cause concern and is now considered a major disease of this host in Kenya. A number of specimens has been received from the Forest Department of identification. The distribution of the disease still

appears to be confined to the east side of the Rift Valley. The study of the fungus and the disease has been continued as opportunity has permitted, especially with a view to the discovery of the channel of infection in nature. It is concluded that infection normally takes place through wounds but it is doubtful if the larger type of wound damage can account for the number of cankers which are observed in the plantations. It is not yet known whether cankers on the main stem follow direct infection or whether lateral twigs are the first to be attacked. It seems possible that infection may occur at the crotch without any mechanical damage being necessary. Infection of the smallest twigs and leaves has not been seen in the field, but laboratory experiments show that if minute wounds are present, such as may possibly occur in nature, infection can take place.

Spraying of six unwounded trees with a suspension of conidia resulted in one tree only becoming infected, presumably through a naturally occurring wound. Infection occurred in every instance when the foliage was lightly rubbed with carburundum powder or pricked with a fine needle. To ascertain how infection occurs is essential before control measures can be suggested and requires further laboratory work and the examination of a large amount of material from the field.

Monochætia unicornis was originally recorded as *Pestallozzia unicornis* by Cooke and Ellis on *Cupressus thyoides* from New Jersey in 1878. No record of it has been published since the present occurrence in Kenya. In view of the virulence of the Kenya fungus, there is some doubt as to the identity of the two fungi. It appears to resemble more closely a species of *Monochætia* recorded in 1933 by Dr. W. H. Long from Beaumont, Texas, particulars of which have been supplied by Dr. W. W. Wagener (in litt.). In the original description by Cooke and Ellis in "Grevillia", the conidia are given as 35 × 8 microns measure 20 – 21.5 × 6.5 – 8 and 22 – 30 × 6–8 microns respectively. The fungus as studied in Kenya appears to be a variable or unstable form. Pathogenic and non-pathogenic strains have been isolated together with an albino strain and others showing variation in cultural characters.

Plans have been submitted for a more intensive survey of the disease.

Miscellaneous

The virus disease of sweet potatoes occurs sporadically but has nowhere reached serious proportions. It seems doubtful if the disease in Kenya in the same as that in the Belgian Congo and Uganda where it is considered a serious menace. It has not been possible to investigate the Kenya disease beyond proving that it is a virus. The disease has been transmitted by grafting. The symptoms induced by grafting were of the severe bunchy top type with clearing of the veins, reduction and crinkling of the leaves and shortening, almost to vanishing point, of the internodes.

A number of examples of the root knot nematode damage was received, mostly from gardens. The pest has, in a number of instances, spread to pyrethrum crops and to commercial crops of eggplant and tomato. A supply of D.D. mixture was received from the Shell Company for experimental work on field control. This work was subsequently taken over by the Senior Agricultural Chemist.

The routine testing of commercial samples of a locally produced yeast was continued.

R. M. NATTRASS,
Senior Plant Pathologist.

ANNUAL REPORT OF THE SENIOR PLANT BREEDER, 1947

Staff

Mr. H. C. Thorpe, Senior Plant Breeder, was on duty throughout the year.

Mrs. B. Storrar, Junior Laboratory Assistant, was on duty from 20th May, 1947, until 5th November.

Mr. H. Moraes, Goan Clerk, returned from overseas leave in April, 1947.

Mr. A. W. Midega, African Clerk, was on duty throughout the year.

Farmers' Days and Lectures

Two farmers' days were held. The Rift Valley Young Farmers' Club visited the Plant Breeding Station and were shown the work in progress in August and a party of farmers was similarly entertained in September. Parties of students from the Egerton School of Agriculture were also shown round during the same month.

Addresses on the work on the Plant Breeding Station were given to the Gilgil District Association and to students at the Egerton School during the year.

Wheat—General

A very wet season was experienced with early rains which continued a month later than usual. As a result yields of wheat throughout the Colony were reduced. At Njoro a rainfall of 50.80 inches was recorded as against the average, over a period of 18 years, of 35.69 inches.

Figures of rainfall recorded at this station were:—

Month	*1947 Inches*	*Average of 18 years Inches*
January	3.37	0.90
February	1.19	1.36
March	3.87	2.81
April	9.82	4.34
May	7.54	4.28
June	4.56	3.64
July	4.83	5.00
August	5.73	4.93
September	5.12	2.19
October	2.14	1.81
November	0.89	2.69
December	1.74	1.74
Totals	50.80	35.69

Rust and Other Diseases

Although leaf rust and glume blotch did considerable damage to susceptible varieties little stem rust was in evidence and was not a factor of importance during the year. Forms K.1, K.2 and K.3 were isolated at various places in the wheat growing areas.

Main Varieties Grown

117.A. and Sabanero were again the main varieties grown in the middle and lower altitude wheat areas with Equator in the higher areas. Increased acreages were sown to 291.J.1.I.1. on account of its strength of straw and good yielding characteristics. In view, however, of its susceptibility to leaf rust from which it suffered considerable damage during the season, coupled with the fact that it is of poor baking quality, the future of this variety would appear doubtful. It is hoped that 291 will be increasingly replaced by 294 strains which combine good straw and yield with better baking characteristics.

Of the two wheats released from departmental control in 1946, Regent has continued to yield satisfactorily. Its good straw and good quality should render it a valuable acquisition provided it remains free of rust. Equator II has kept up its initial promise and a considerable acreage was sown to this improved selection during the season. Seed supplies of both these wheats are now sufficient to meet the Colony's requirements.

Pedigree Seed

Rhodesian Sabanero.—A single plant selection from Southern Rhodesia. Trials show it to ripen more evenly and to be a somewhat better yielder than the unselected parent strain although in other respects, i.e. in straw strength, disease desistance and quality it is roughly its equal. Figures from the yield trials are given later on in the Report. Stocks were increased to 647 bags which will be carried over into 1948 for further multiplication and final test.

117.A. Selected.—Stocks of this selection were increased to 270 bags which are to be planted during the next season for further increase.

Releases of New Wheats

One new wheat, 294.M.7.C.6.A., was released from departmental control. It is a selection out of the cross Australian 26.A. × 117.A. and is a beardless, white chaffed, white grained wheat possessing fair to good straw strength and medium length maturity ripening in approximately 5½ months at Njoro, 7,100 ft. It has full resistance to the seven biologic forms of black stem rust occurring in the Colony, possesses appreciable resistance to brown leaf rust and is resistant to yellow ear rust up to about 8,000 ft. in Kenya. The grain is of moderate milling quality and is acceptable to the mills. It has yielded satisfactorily in the Njoro, Londiani and Mt. Elgon areas of Kenya.

This wheat, therefore, represents a substantial advance on 291.J.1.I.1. both in quality and in the range of altitude over which it can be grown. These facts, together with its leaf rust resistance, make it a valuable addition to Kenya wheats. Two thousand, seven hundred bags were available for sowing in 1948.

New Wheats under Multiplication

Cross No. 261 (68.E.12.A.1. × Reliance).—Six hundred bags of one strain, 261.R.7.C.1.B., were harvested during the year. It is a quick, bearded, red grained variety having good quality. The straw is, however, on the weak side but in view of its good baking characteristics multiplication of this strain will be continued for a further season as it may be found suitable for the lower wheat areas where quick maturity is required.

Cross No. 294 (Australian 26.A. × 117.A.).—Four hundred bags of 294.B.2.A.3., a quicker selection than 294.M.7.C.6.A., were reaped and part will be carried forward for trial in 1948. This white grained strain, which is of moderate quality, may also be suitable for the lower areas.

In addition, approximately 470 bags of three further strains, M.7.C.6.C., M.7.C.1.C. and H.2.A.1. will be further multiplied and tested next season.

Cross No. 318 (Rust Resistant Selection out of D.C. by Ceres × 112.E.8.L.5.).—Two strains are under increase and field tests. 318.AJ.4.A.1., a beardless white grained selection, has tall but strong straw, full rust resistance and is of moderate baking quality. It yielded 8 bags an acre on a field scale at Njoro and the 270 bags reaped will be carried on in 1948. The second selection, 318.O.3.B.2., of which there are approximately 200 bags, is very similar, shows a border line reaction to K.3 but has more resistance to yellow rust at the higher altitudes.

291.J.1.1.1. Selected (Australian 26.A. × 58.F. (L.1.).—The bulked single plant selections of highest bushel weight, described in the Annual Report for 1946, were multiplied by a grower. Yield was satisfactory but, in view of the leaf rust susceptibility and poor quality of the parent strain, it is problematical whether

this selection is worth going on with. It will, however, constitute a purified source of seed if required.

Cross No. 338 (192.Q.2.A.L. × Australian 27/2.2.1.5.).—One strain of this cross, 338.AA.1.A.2., has now reached the bag stage and was issued to a grower at Ulu for multiplication over the short rains 1947–48. This strain has shown itself to possess good straw and disease resistance and was found by Dr. Kent-Jones to be of excellent milling and baking quality. The cross is bred to suit short season conditions such as Nairobi and the Arusha District in the Northern Province of Tanganyika.

Wheat Breeding at the Plant Breeding Station, Njoro

New Hybrids Undergoing Multiplication. 321.BT.1.B.1.—A selection from the cross Australian 45.C.5 × 117.A. This has now reached the bag stage and will be issued to a grower for increase in 1948. It is fully rust resistant with good straw and useful baking characteristics.

351.AS.1.B.2. (117.A. × Regent).—This wheat has rather weak straw and some susceptibility to leaf rust. Further tests will be carried out.

360.H. (294.M.7.C.6.C. × 184.P.2.A.1.E.).—This variety has good straw, useful baking quality and is of promise. It came second in the yield trial at Njoro.

Selected strains from the crosses 337, 340, 341, 342, 344, 350 and 351 were increased. For details concerning these crosses reference should be made to the Annual Report for 1946.

As in previous years trials were also carried out at the high altitude station at Molo, 9,300 ft., and at the Scott Agricultural Laboratories, Kabete, 5,700 ft. Both stations serve as additional testing grounds for stem rust whilst the Molo sub-station, in particular, provides a very severe test for yellow rust.

Yields of some newer Hybrids.—The following table gives yields of some of the newer hybrids at Njoro, 7,100 ft. and at Rongai, 6,000 ft. approximately. Figures have been extracted from the yield trials.

YIELDS OF SOME NEWER HYBRIDS AT NJORO AND RONGAI

VARIETY	NJORO		RONGAI	
	Yield	Maturity	Yield	Maturity
184.P.2.A.1.F.	—	—	7·1	131
318.AJ.4.A.1.	7·2	179	—	—
360.H.	6·0	168	—	—
261.R.7.C.1.B.	5·8	132	6·6	114
294.M.7.C.1.C.	5·3	152	5·8	140
Sab.Rhodesia	5·2	162	4·5	150
321.BT.1.B.1.	5·0	170	—	—
318.O.3.B.2.	4·6	179	—	—
291.J.1.I.1.	4·5	153	5·5	134
Sabanero	4·5	163	4·1	150
294.M.7.C.6.A.	4·5	160	5·0	142
294.H.2.A.1.	4·4	137	6·7	122
294.B.2.A.3.	3·9	135	6·4	122
117.A.	3·8	168	3·8	149
294.AN.5.B.3.	—	—	5·8	114
	P.05=0·8 P.01=1·0		P.05=0·8 P.01=1·0	

Yields are given in bags per acre and maturities in days. Low yields at Njoro are due to excessive rain.

Cage Material.—The list of crosses enumerated in the 1946 Annual Report have now advanced a further generation and some of the material is becoming fixed. Selection work continued and, without going into detail, the characters aimed at are disease resistance combined with good straw, quality and yield.

The latest series of crosses with the Australian wheat Warigo, which is resistant to leaf rust, were badly attacked by glume blotch to which this Australian parent appears very susceptible.

Importations.—Five wheats from Australia, Celebration, Charter, Gaboo, Kendu and Yalta suffered from excessive rain and, although not attcked by stem rust, all suffered badly at Njoro from glume blotch and leaf rust and were severely damaged by yellow rust at Molo. They will be sown again in 1948. It may be stated that Australian wheats are, in general, well suited agronomically to Kenya.

A comprehensive series chiefly of European wheats were kindly sent by Dr. H. G. Bell of Cambridge and comprised the following: Atle, Blanka, Browick, Fylgya, Holdfast, Iron, Glendowe, Joss IV, Square Heads Master, Master's A.1, Meteor, Red Fife, White Fife, Steadfast, Thule, Van Hack, Yeoman II and Wilhelmina.

Some varieties, mainly winter types, produced no grain at all at Njoro but remained permanently in the grass-like stage until killed off by leaf rust and the dry season. It is of interest to note that some, but not all, of these varieties did produce grain at Molo under the stimulus of the colder climate obtaining there. Those varieties which did mature proved far too susceptible to stem rust and were virtually destroyed at Njoro although a few put up a better performance at Molo. Nothing, however, was observed which would have any chance of success in Kenya. This is not surprising since it has been shown from past tests that European wheats are unlikely to succeed here owing to their susceptibility to stem rust. It may be recorded that the period to maturity varied between 216 and 267 days at Njoro and from 211 to 290 days at Molo. This long growing period is an added disadvantage attaching to European wheat varieties. It was observed that some varieties matured more quickly at Molo than at Njoro due, presumably, to the stimulus to earlier development given by the colder Molo climate.

It is therefore, in my opinion, unlikely that those characters required by wheats to be grown in East Africa, e.g. rust resistance and a short growing period, will be obtainable from European wheats. Such characters are, however, found in wheats from America, Canada and Australia and great use has been made, on a reciprocal basis, of wheats bred in these countries in progressively building up wheat varieties suited to our conditions.

The Australian variety Warigo proved too susceptible to stem rust for growing in the Colony but its resistance to leaf rust makes it of value as a parent in crosses designed to transfer this character to Kenya wheats.

The American durum wheat Carleton, C.I.12064, first imported in 1945 and found susceptible to stem rust, was increased during the year. It stood well and remained free of rust but in view of its susceptibility it will probably have to be discarded.

The American hard red spring wheat Newthatch, C.I.12318, was further multiplied. It remained free of stem and leaf rust but was appreciably attacked by glume blotch. Its leaf rust resistance will make it of value as a parent and may provide a further and independent source of leaf rust resistance for incorporating into Kenya wheats.

A number of durum or macaroni wheats, BB.55, Q Durum H, Exh 49 C, Exh 52, Giza 136 and Misfit received from Egypt were all attacked to a varying extent by stem rust.

Two Canadian durums, Mindum and R.L. 1183, suffered slight rust infection.

A reliable rust-proof durum wheat is required for the atta trade. The variety at present grown, Golden Ball, is too susceptible to rust to be produced in any quantity.

New Crosses.—One only new cross was made, Newthatch × 291.J.1.I.1., to attempt to transfer the leaf rust resistance of Newthatch to the 291 variety.

Baking Quality Tests and Pelshenke Wholemeal Fermentation Tests.—Samples of advanced hybrid material is sent, by the courtesy of Messrs. Unga, Limited, Nairobi, to Dr. Kent-Jones for tests of baking quality. In addition, Pelshenke tests are carried out on all new hybrid material. These tests consist, in essence, of mixing a ground and weighed quantity of the wheat under test with a measured volume of a standard yeast solution and noting the time the dough ball takes to swell and burst in water at a controlled temperature. They serve as a guide to quality in the early stages of selection when material is very limited in amount.

Wheat Breeding at the Scott Agricultural Laboratories (5,700 ft.)

Cross No. 339 (192.Q.2.A.L. × Australian 37.2.5.4) has now reached F6 but many cultures still appear unfixed. Further selection was carried out and the most uniform lots carried forward into multiplication plots in 1948.

Cross No. 356 (184.P.2.A.1.F. × 192.Q.2.A.L.) and No. 358 (184.P.2.A.1.E. × 294.P.2.A.3.) the aims of which are to combine the good yield and baking quality of 184 with the straw strength of the second parent were again subjected to vigorous selection, those segregates of quality being carried over to 1948.

Wheat Breeding at the Molo Substation (9,300 ft.)

At Molo the aim is to combine straw strength, quality and yield with resistance to yellow rust, a factor of considerable importance in wheat production at the higher altitudes. There is need to find a substitute for Equator, the standard variety at these heights, which although a farmers' wheat in that it yields well and has stood the test of time is not liked by the miller on account of its poor baking quality.

A yield trial of some of the new bybrids which, it is hoped, may replace Equator gave the following interesting results.

Wheat Yield Trial, Molo

Variety	Yield	Maturity	Bushel Weight
341.F.2.D.1.	13·3	207	61
337.BE.2.F.2.	13·1	185	58
350.AD.9.C.2.	12·3	185	61
337.V.3.B.1.	10·5	185	61
340.Y.4.A.1.	10·3	207	64
241.O.2.B.1.	9·6	207	63
Equator II.	8·9	244	64
350.AD.9.B.1.	7·1	207	63
337.V.1.B.1.	4·9	207	54
337.V.3.A.2.	2·9	207	48
337.V.3.A.1.	1·4	207	41
	P.05=1·9 P.01=2·5		

Yields are given in bags per acre and maturity in days.

The failure of the last three wheats was due to yellow rust damage which is shown in the shrivelled grain and low bushel weights and serves to emphasise the importance of yellow rust resistance in wheats to be grown in the higher areas.

It is interesting to note that several of the new hybrids have out-yielded the standard variety Equator.

Barley

The barley variety trial at Njoro again demonstrated the superior yielding qualities of Glacier, Mariout and Research, in comparison with the standard variety Prior. Both German barley and Kenia were once more low yielding and were again attacked by leaf diseases and will have to be discarded.

Results of this year's yield trial are appended.

Barley Yield Trial, Njoro

Variety	Yield	Maturity	1,000 Corn Weight	Nitrogen
	Bags per Acre	*Days*	*Gm.*	*Per Cent.*
Research	11·9	144	36·9	1·82
Mariout	11·5	140	39·1	1·81
Glacier	10·9	140	36·1	1·70
Maltworthy ..	9·1	130	39·5	1·89
Kenia	8·5	154	26·5	1·82
Prior	8·3	128	36·9	2·02
German	6·3	144	35·9	2·16
	P.05=1·9 P.01=2·6			

Low yields are ascribable to the wet year and all 2-row malting types had a steely rather than a mealy cut. Nevertheless, on past performance coupled with this year's results, Research is clearly of value and was in fact increased on a field scale by growers during the season. Both Glacier and Mariout, 6-row barleys suitable more for feed than for malting purposes, were increased by farmers during the season and reports of their performance on a field scale have been encouraging.

Barley Importations.—The following English barleys were sent by Dr. Bell, Cambridge: C.R. Dense, Irish Goldthorpe, Pioneer, Plumage, Plumage Archer, Prefect, Spratt and Spratt Archer. At Njoro C.R. Dense and Pioneer took 290 days to mature the other varieties ripening in 170 to 180 days whilst at Molo they all matured in approximately 245 days. As with some of the European wheat varieties mentioned earlier in the Report, both C.R. Dense and Pioneer were stimulated to earlier development in the colder conditions of Molo. In so far as disease was concerned all were attacked to a greater or lesser extent by leaf blotch although one variety, Prefect, a hybrid barley produced by Dr. Bell, remained very free of disease and had the appearance of being a good yielder.

A barley from the Argentine, sent by the East African Breweries, Ltd., as a suitable malting type was found to be very mixed. It possessed short weak straw and suffered badly from leaf diseases.

Oats

Owing to very wet conditions early planted oats lodged and poor yields were obtained but later plantings were more successful. The standard variety Lampton was badly attacked by leaf rust in some areas and destroyed although in later

sowings good yields were obtained a figure of 18 bags per acre being recorded at Molo.

Achilles, a recent importation from New Zealand, was slightly attacked by rust but suffered no appreciable damage. This variety was further increased by farmers during the year and, though still under departmental control, will be released in 1948 if it continues to be satisfactory. Unfortunately it is, like Lampton, possessed of a strong black awn and must be regarded more as a feed than as a milling oat.

The six new oats from Canada, described in the 1946 report, were all attacked to a greater or lesser extent by stem rust although, as in the past season, two of them showed rather more resistance and will be carried on.

A range of oat varieties, some of which were sent by Dr. Bell, Cambridge, included the following: Abundance, Picton, Potato, Resistance, Black Tartary, Grey Winters, Black Winters, Victory, S.82, S.84, S.147, S.173, Avena nuda, Avena strigosa, Black Supreme, Early Miller, Saegar, Star and Yielder. At Njoro all these varieties were severely attacked and destroyed by crown rust, many failing even to flower. None produced grain. At Molo most were attacked by stem rust and all put up a very poor performance. They will all have to be discarded. It has been observed from past trials that European small cereals, with the exception of barleys, are unlikely in general to succeed in Kenya.

The following American and Canadian varieties were all infected by stem rust to a greater or lesser extent: Ajax R.L. 1114, Exeter R.L. 53, Hancock C.I. 3346, Marion C.I. 3247, Fultex C.I. 3531, Vicland C.I. 3611 and Boone C.I. 3305.

Maize Seed Competition

The Competition, in abeyance during the war years, was re-started at three centres, Kitale, Njoro and Solai. Results are being published elsewhere and it is encouraging to note that farmers who practise yearly selection on the lines advocated by the department have consistently done well in the Competitions.

The ultimate aim is the formation of a Kenya Seed Maize Growers' Association for the production and sale of proven high yielding strains of maize suited to the various areas of the Colony.

Hybrid Maize Trials

Extensive trials of hybrid maizes imported from America were carried out at numerous stations in Kenya. Preliminary results show performance to be poor and it is unlikely that any of the hybrids will be of use to us. Varieties tried were: Texas Yellow Hybrids, Nos. 10 and 12, Texas White Hybrid No. 9, Pontiac, Stowell's Evergreen, White Hybrid Field Corn 9W, Yellow Hybrid Field Corns Nos. 12 and 18, Field Corns Nos. W19, and W59.

This result is not surprising since it is well known that maize is extremely sensitive to environment and American hybrid corns bred to suit American conditions which are very different from those in Kenya are, therefore, unlikely to succeed in this Colony. It is, I think, self evident that the hybrid corn industry is essentially a home industry and the production of hybrid varieties must constitute *ad hoc* work using, mainly, local acclimatized and selected strains.

Hybrid corn work and the production of inbred lines was started by the Plant Breeding Services in 1930 and the first series of double crosses tested in 1939 and 1940. No hybrid variety then produced was found to out-yield local maize and the war put a stop to further work.

Until such time as maize breeding work is re-started and success achieved farmers are strongly advised to practise yearly selection of their seed maize on the lines recommended by us and described in K.I.O. Fortnightly No. 98 of 2-12-46. It has been clearly shown through the Seed Maize Competitions that a high yielding type of maize can be selected and maintained by such methods with very little trouble.

Pyrethrum

Work on pyrethrum breeding and selection continued. Approximately 250 single plant selections were analysed by the chemical section during the year and of these 11 were found to have pyrethrins contents of 2 per cent and more. This material was increased and the clones planted out in pairs at Ol'Joro Orok and Molo in plots away from other pyrethrum for seed production. The resulting seed will be sown in 1948 and the crop tested for yield and toxicity. These clones have also been planted in yield trials at Molo and at Subukia so that their yields, as compared with unselected pyrethrum, may be assessed. In particular the lower altitude Subukia trial will show their performance under hotter conditions.

Plantations established during the year from H.T.2 seed produced in 1946 in conjunction with the Pyrethrum Board have started to bear and, whilst it is yet too early to say much about productivity, preliminary reports show the flowers to have a satisfactory pyrethrins content. This project for increasing rapidly the toxicity of Kenya flowers was fully described in the 1946 Annual Report.

Acknowledgments

My thanks are due to the pathological section for testing and identification of physiologic rust forms and for the production of material for artificial rust epidemics in the breeding cages; to Mr. H. C. Pereira for design of statistical experiments and evaluation of results; to Mr. W. H. Hewitt for help with the sowing and harvesting of wheats at the Scott Agricultural Laboratories; and to the officers of the Pyrethrum Stations, Mr. E. W. Gaddum and Dr. U. Kroll, for assistance in planting and recording the pyrethrum breeding material.

H. C. THORPE,
Senior Plant Breeder.

ANNUAL REPORT OF THE SENIOR AGRICULTURAL OFFICER (PASTURE RESEARCH), 1947

Staff

The Senior Agricultural Officer (Pasture Research), Mr. D. C. Edwards, was on overseas leave from November, 1946, until July, 1947, during which time Mr. R. O. Williams, Agricultural Officer, was in charge. Messrs. A. V. Bogdan and J. A. Allan arrived in January and August respectively on first appointment as Pasture Research Officers, the latter on transfer from Cyprus. Mr. H. M. W. Webb was appointed as Field Assistant in October.

2. Mr. Bogdan took charge of the systematic work at headquarters and the bulk of the recording required on co-operative experiments connected with pasture problems in various parts of the country. An account of his work during the year is given in a separate report. Mr. Allan was posted to the Agricultural Station at Ol Joro Orok, with a view to the establishment of pasture experiments at that station, bearing upon the problems of the region, and also to supervise grass seed production by growers in the highlands. This arrangement was made pending the provision of regional research stations, to one of which it is intended that he should be posted. Mr. Webb was stationed at the Kabete headquarters in connexion with experimental work there.

General

3. The three main lines of work indicated in previous reports were maintained. These lines are:—

(*a*) Survey of the vegetation in regard to the distribution and extent of the chief communities.

(*b*) Management studies of the important natural grassland types.

(*c*) Experiments on individual pasture species with a view to ley establishment and with crops for fodder storage.

4. It is intended that the two latter sections of work should be based upon stations sited in the five main ecological regions of the country as determined by the communities of vegetation. Such a plan is the only reasonable approach to investigation of not only the pasture problems, but also of the problems of general agriculture awaiting solution in a country which includes the widely different climatic and other environmental conditions of Kenya. This plan was accepted for East Africa in respect of pasture research by an inter-territorial conference held in 1940, but it has not yet been found possible to implement the recommendations of the conference. Work on the types of natural grassland has therefore been confined mainly to co-operative experiments on farms which, although they might provide a suitable means of extending the work of research stations, are obviously inadequate as a substitute for these stations. It has been possible to make considerable advance in the investigation of individual pasture plants for ley establishment by concentrating the experiments at Kabete which is in an intermediate region, and the stage of practical application of results has been reached in regard to certain grasses of which large-scale seed production through growers is in progress. Advance in this work would, however, also be greatly facilitated were it possible to carry out early trials of the species at properly sited regional stations.

Survey

5. Survey was carried out in north Turkana and the southern Sudan in connexion with certain political problems. Most of the information obtained in this section, some of which has already been presented in map form, has resulted from investigations primarily concerning such problems.

Natural Grassland Types

6. Main attention was devoted to the following problems connected with atural grasslands:—

(1) Methods of management and the question of grass-burning in the extensive *Acacia-Themeda* community of the highlands. The evidence from this work is as yet inconclusive.

(2) Management designed to suppress the useless coarse-grass phase dominated by *Pennisetum schimperi* in favour of desirable *Themeda triandra* (Red Oat grass)—dominated herbage in the important farming region of transitional vegetation lying between the true Kikuyu grass country and the *Acacia-Themeda* community. This work has afforded a clear indication that the desired change can be produced by the use of fire in herbage accumulated by protection from grazing.

(3) Investigation of deteriorated *Cynodon* (Star Grass) pastures in the Rift Valley. The vegetation concerned is characteristic of old lake beds which, although they are limited in extent, are of considerable economic importance and normally afford pasturage of high quality. As a result of mismanagement over many years accentuated by recent protracted periods of drought the herbage has been extensively invaded by inferior *Aristida adscensionis*, an annual grass which, in addition to its low pasture value, threatens to preclude sheep farming on account of the objectional nature of its fruits which penetrate the wool and hides of the animals. Experiments have been established with a view to discovering a practical means of maintaining the *Cynodon* herbage, but they are in the initial stages and no conclusions can yet be drawn from the work.

Temporary Leys

7. Progress has been made in the development of ley farming, particularly in ıe areas of European settlement, and the imperative necessity of maintaining soil ɪructure under local conditions by the use of temporary grass in the arable ɒtation is being increasingly recognized.

8. With the exception of limited areas at very high elevations, where certain ɒecies of temperate origin might prove of value as temporary pasture, it has ɐen necessary to experiment mainly with grasses and legumes of which there little experience under cultivation. The work has been directed chiefly towards ıvestigation of the indigenous flora, and during the year, several promising ɾasses were carried to the seed production stage preparatory to management ɤperiments, in addition to the species which are already in extensive use and hich form the basis of the present development towards ley farming.

9. Of the grasses which have become a part of established practice, the main ɘquirement is for seed of the Nzoia Strain of Rhodes grass (*Chloris gayana*), hich is adapted for use over the principal agricultural region lying between 000 and 6,500 feet altitude and with minimum annual rainfall of approximately) inches (*see* E.A. Agri. Journ., Vol. IX, pp. 62–68, 1943). Further, recent dications both in Kenya and the U.S.A. suggest that this strain might prove f value in cooler regions than has hitherto been supposed, and its range might ɐ considerably extended. Seed production has been undertaken through growers, ıt so far the schemes adopted have failed to meet the increasing local demand. appears unlikely that the present arrangement, made in 1947, by which the ɾvices of an agent for disposal are virtually eliminated and growers are ɘrmitted to supply their neighbours, will result in either adequate control of ıality or suitable distribution.

10. *Bromus marginatus*, a grass of sub-tropical origin, has gained consider- ɭle popularity as a ley in the relatively restricted region at higher elevations,

and during the year seed produced under a Government scheme exceeded the demand, leaving a surplus in the hands of the agent.

11. Grasses which have shown promise in preliminary trials and which have recently been increased with a view to further work are as follows: *Pennisetum stramineum* and an erect form of *Cenchrus ciliaris*, both of which occur naturally at the drier fringe of the *Acacia-Themeda* vegetation of the highlands and in the Desert Grass-Bush community; the Chania Ecotype of *Melinis minutiflora* (Molasses grass) found in the highlands region near the Chania River; a *Setaria* species (probably an ecotype of *S. sphacelata*) obtained from the Nandi area under high rainfall and relatively low temperatures. These grasses have all shown good seeding qualities, lack of which is one of the most common defects of indigenous species.

12. There is little advance to report in the search for pasture legumes intended for use in mixture with the ley grasses. Several further species have been obtained and are undergoing preliminary trial, but no type which is entirely satisfactory has yet been discovered. As in the case of the grasses, the requirements of various climatic regions are different, and in the high-altitude areas where *Bromus marginatus* is in use as a ley, the necessity to supply a legume scarcely arises, since the indigenous clover (*Trifolium johnstonii*) is common and it tends to invade any suitably managed sown pasture. Although the provision of legumes with the grasses in the artificial establishment of pasture would obviously be a desirable advance, the requirement of immediate importance under local conditions is the provision of a temporary grass cover in the arable rotation, as a means of maintaining the soil in a suitable physical state (*see* Annual Report, Pasture Research, 1945).

Crops for Fodder Storage

13. Work was continued on the comparison of crops for fodder storage. The main advance was again connected with the development of a local *Sorghum*, Kavirondo Perennial Sorghum, which is capable of rapid production of material for ensilage under the rainy seasons of short duration which occur at the drier fringe of the mixed farming region. An improved type bred from the original material was made available commercially under the name of "Improved Kavirondo Sorghum", R2S42 (*see* E.A. Agric. Journ., Vol. XIII, p. 202, April, 1948).

Identification of Pasture Plants

14. As already indicated, this section of the work was taken over by Mr. Bogdan, and during the year approximately 150 specimens were identified for officers of the Agricultural and Veterinary Departments and for private individuals. A collection of 1,500 local plants was made in connexion with pasture investigation. Grateful acknowledgment is made of the assistance received from the East African Agricultural Research Institute, Amani, Tanganyika and of the considerable use which has been made of the herbarium at the Corydon Memorial Museum, Nairobi.

Plant Exchange

15. Planting material was supplied since the last report on this subject in response to requests from the following countries: Southern Rhodesia, Basutoland, U.S.A., Palestine, Australia, Jamaica, Uganda, British Somaliland, Gold Coast, Hong Kong, Zanzibar, South Africa, Madagascar, Hawaii, Tanganyika and Nigeria. Material was received from U.S.A., South Africa, Nigeria and England.

D. C. EDWARDS,
Senior Agricultural Officer (Pasture Research).

ANNUAL REPORT OF THE PASTURE RESEARCH OFFICER, SCOTT AGRICULTURAL LABORATORIES, 1947

The study of natural pastures even for practical purposes requires a certain nowledge of the local flora, particularly of grasses. The main sources of informa- on on Kenya grasses are Volume IX and X of the Flora of Tropical Africa. 'olume X has not yet been completed and a large group of grasses (*Eragrosteæ*, *Chlorideæ*, etc.) has not yet been published. The study of recently made ollections has shown that even in the published part many of the Kenya grasses ave not been mentioned as occurring in this country. Apart from the Flora of Tropical Africa there are two issues of "East African Pasture Plants" containing escriptions of 40 grasses. No other books of a systematic character on Kenya rasses are available.

2. The scarcity of information on Kenya grass-flora and the necessity to ave keys for the easy identification in the field for pasture research work were easons for the work on grasses in 1947. The available literature and herbaria f the Corydon Museum and the Scott Agricultural Laboratories as well as that f the Pasture Research Section, and my own collections have been used. A list f 370 species of grasses and the keys (which have been made as simple as ossible to facilitate the identification and to make it possible not only for otanists, but for Agricultural Officers and the more interested farmers as well) ave been made as a result of this work.

3. Some groups of grasses have been studied more closely, e.g. the genus *Pennisetum*. Some species of this genus, out of 19 species occurring in Kenya, are f great (positive or negative) importance in pastures. A revue of Kenya species f the genus has been prepared for publication.

4. Similar work was begun on legumes. It has been started from the sub-family *Mimosaceæ*, where belong mostly shrubs and trees which naturally have no grazing alue but some of which are important in determining the types of natural (also astoral) vegetation. The keys to *Mimosaceæ* have been published in "Nature in East Africa" (Nos. 2 and 4, 1947). Keys to some genera of *Papilionaceæ* have also een made.

Pasture Ecology

5. In order to collect information on ecology and distribution of grasses and lso to assist the Agricultural Officers in naming grasses and preparing herbaria f local grasses and legumes, some localities (Kitale, Njoro, Machakos) have been isited.

6. In Machakos District some observations were made in the central, low art of the district and also in the Mbooni Hills and Makueni Settlement areas.

7. In the central, low part of Machakos native reserve where the grass cover s very poor, the vegetation is represented by poor grass-tree or grass-bush ormations with *Acacia spirocarpa* as a dominant tree. In the herbage the most mportant grasses are: *Aristida adscensionis* (occasionally *A. lommelii*), *Amphilopsis pertusa, Cenchrus ciliaris, Digitaria milanjana, Eragrostis superba, Heteropogon contortus, Hyparrhenia filipendula, Latipes senegalensis, Chloris nyriostachya, Chloris pychothrix, Panicum maximum, Pogonarthria squarrosa, Rhynchelytrum roseum, Themeda triandra* (Red Oat Grass) and *Cynodon plectostachyum*. The grass-cover is usually very sparse and 50 per cent to 90 per ent of the surface consists of bare soil, devoid of vegetation. Among grasses, *Aristida adscensionis*, a grass of a very low feeding value, usually dominates with poor representation of some other grasses. Useless as a pasture plant, *Orthosiphon gofensis* (Labiatæ family) is often co-dominant. The scarcity of the rass-cover is apparently due much more to uncontrolled grazing in previous years han to unfavourable climatic conditions. The existence of much better grass- over (often with *Themeda triandra* as a dominant) in adjacent European farms

as well as in some localized areas protected from grazing in the native reserve, scattered poor specimens of good perennial grasses even on the deteriorated slopes and the type of soil, which can hardly be considered as a desert soil, show that a better grass-cover can exist here and apparently existed in the past.

8. Efforts to restore the original grass-cover have been made by protecting from grazing some localized areas, but the results of this are not as good as had been expected. *Aristida adscensionis*—an undesirable annual grass—appears in masses and becomes a dominant in the first years of protection giving way to the better grasses very slowly. This is quite normal because the restoration of the natural grass-cover on bare soil usually begins with the domination of annual plants; perennials dominate later. The process of restoration of the original cover may take some 5–10 or even more years. It is possible to speed the process to a certain degree by means of cutting the herbage once or twice every year (as is known for dry parts of Eastern Europe) but even so the desired change is slow, and the planting of superior grasses is probably the quicker way to create good pastures. Work in this direction has been started by the district Agricultural Officer and has already shown good results. Apart from the grasses already tried two further local grasses could be used: *Digitaria milanjana* and *Eragrostis castellaneana*. They both form small tufts and at the same time have creeping and rooting runners. Both are well grazed by stock. *D. milanjana* usually grows higher than the *Eragrostis* but the latter can apparently better establish itself on hard unloosened soil.

9. At Mbooni Hills, some hill-tops (about 6,000 feet altitude) are covered with natural pastures where Molasses Grass (*Melinis minutiflora*) dominates. A fern (*Pteridium aquilinum*) is often present in these pastures, particularly near the lower margin. The fern apparently comes from the adjacent slopes (where it forms dense thickets on extensive areas) and threatens to replace the good grass cover.

10. Extensive work has been done in connexion with the experimental grazing plots laid down at Soysambu Estate, Elmenteita. The plots have been established in order to discover the cause of invasion of Star Grass (*Cynodon*) pastures by *Aristida adscensionis*, an annual grass, undesirable and even dangerous in pastures, and to find the type of treatment required to suppress *Aristida*. A chart of the vegetation has been prepared, showing the proportion of Star Grass and *Aristida* in the experimental area (180 acres). Initial readings of 37 line-transects (total length about 5,000 feet) were made in connexion with records designed to trace the changes resulting from the various plot treatments.

Identification of Pasture Plants

11. The following work has also been done:—

(*a*) 1,500 herbarium-specimens, mostly grasses, legumes and sedges have been collected.

(*b*) About 150 specimens of grasses and legumes have been identified for departmental officers and farmers.

(*c*) 250 herbarium-specimens of grasses and legumes have been prepared for Agricultural Officers.

A. V. BOGDAN,
Pasture Research Officer.

ANNUAL REPORT OF THE AGRICULTURAL OFFICER (PYRETHRUM SERVICES), 1947

Staff

Mr. E. W. Gaddum, Agricultural Officer (Pyrethrum), was in charge hroughout the year. For the first three months of the year he was stationed at Molo, but from April onwards he was stationed at the Government Experimental Farm, Ol Joro Orok, which is now the main station for pyrethrum experimental vork.

Dr. U. Kroll, Pyrethrum Assistant, was stationed at Molo throughout the ear.

Trained native staff consisted of six Field Assistants and a clerk.

Experimental Stations

Ol Joro Orok.—The construction, on the Government Experimental Farm, f housing for Europeans and natives was completed by March and the staff noved in immediately.

Work during the year has mainly consisted in maintaining the various trials lanted in 1945. Some new trials were planted, including a rotation trial. The reeding work, carried out in collaboration with the Senior Plant Breeder, was ontinued. Yields were disappointing. This was mainly due to a heavy hailstorm n July coupled with the fact that the rains finished off very early, in October.

The Ngata drier, erected by the Pyrethrum Board in 1946, came into use this ear and gave satisfactory service.

Molo.—Following the decision to post the Pyrethrum Assistant and the gricultural Officer (Horticulture) permanently at Molo, development work has roceeded rapidly. Labour lines constructed of cedar offcuts with shingle roofs ave been built for the accommodation of 16 single labourers and 4 married abourers. Buildings of a similar type have also been erected for a clerk and three ield Assistants.

Work on the construction of a three-roomed office with stone walls and a edar shingle roof was started, but the building was not completed by the end of he year.

A wooden store was moved from the Seed Station, Turi, when it closed own and re-erected on the Molo station. This has served as a temporary office ending the completion of the new office.

Work was started on the building of a wooden shed to house the experimental rier and to provide room for weighing and storing small samples.

Shortly before the end of the year, final sanction was obtained for the uilding of a house for the Pyrethrum Assistant and work on levelling the site as started.

The above building programme is largely for the joint benefit of the gricultural Officer (Horticulture) and the Pyrethrum Assistant and was planned ccordingly.

The road of access was stone surfaced and some further clearing and stumping ere carried out in preparation for future planting.

Further progress was made with fencing. A fourteen-acre paddock was fenced nd work on the southern boundary fence was completed.

Experimental work was largely a continuation of the trials of previous ars. Work on *Ramularia* disease continued. In spite of the heavy rains this ar and the presence of the Bud Disease, yields were about normal

The area of the station was increased so as to include some extra vlei land for stock. Its present area is 136 acres.

Kinangop.—No new trials were planted this year and the work has consisted in maintaining the trials planted in 1945 and 1946.

Subukia.—The work has been mainly a continuation of the trials planted in 1946. A trial of some high toxic strains was planted in order to test their performance at a low altitude.

Kitale.—The plantings made in 1946 came into flower this year. A fence was erected round the plots.

Experimental Work

Thirty statistical trials were being picked in 1947. A few of these were planted this year but the majority were started in previous years. Details are given in the following table:—

Experiment	*Ol Joro Orok*	*Molo*	*Kinangop*	*Subukia*	*Kitale*
Cutting Back	1	1	—	—	—
Fertilizer	1	1	1	1	1
High Toxic (14 × 24) ..	1	1	1	1	1
Other H.T. Strains	1	1	—	1	—
Ox Cultivation	—	—	—	1	—
Repeated Trimming ..	1	—	—	—	—
Rotation	2	—	—	—	—
Seedlings *v.* Splits	1	1	1	—	—
Spacing	2	1	1	1	1
Transplanting Skill ..	—	1	—	—	—
Weeding	1	—	—	—	—

The main experimental work in addition to these formal trials consisted of work on the *Ramularia* (Bud) Disease but small trials were also carried out on fertilizers, blind plants, petal-less flowers, etc.

Some work was also carried out on new implements, notably two types of transplanter and a flame gun.

As the experimental year is not yet complete, it is not possible to give final results for the 1947–48 experimental season. The following account, therefore, summarizes the 1946–47 results plus such data as are at present available from the current season.

Cutting Back.—Two trials were in progress to ascertain the effect of light and heavy cutting back as compared with not cutting back. These treatments were carried out early in the dry season, late in the dry season and twice a year. Rather surprisingly, none of these treatments had a significant effect on the yield of second year pyrethrum.

A point of importance as regards *Ramularia* disease is that plants which are not cut back have a larger incidence of diseased buds.

Fertilizers and Mulch.—In the last Annual Report, it was stated that phosphates applied in the planting holes had had no lasting effect. Since this was written there have been two instances of phosphates in the planting holes giving significant increases in yield in the first season. One case occurred on a rather poor, acid soil on the Kinangop and another on apparently fertile, freshly broken ground in Subukia.

Increase in Yield due to Phosphates in the Planting Holes

	(*Pounds of dry flowers per acre.*)	
	Kinangop	*Subukia*
Treated	586.4	173.5
Control	427.7	128.9

Usually, it is considered that the response to phosphates in the planting holes is transient and uneconomic, but these cases indicate that no general rule can be given.

No response has been obtained to phosphates drilled between the rows even on the Kinangop and Subukia soils referred to above.

The response to lime has been variable. At Molo and Subukia it has had no effect. On the Kinangop trial, it had a stimulating effect where the soil was very acid (pH 4.9) and a depressing effect where the soil was only fairly acid (pH 5.2). At Ol Joro Orok, the application of lime depressed the yield over the first two years and it is only in the third season that its deleterious effect has worn off.

Mulching is giving encouraging results on some stations but it must be applied towards the end of the rains and be allowed to wear thin in the succeeding rains.

High Toxic Varieties.—Trials of the H.T. strain (14 × 24) were continued and the results in general confirm previous findings. Last year, it was stated that this strain was possibly not suited to the lower altitudes. This view has now been confirmed with the result that growers below 7,500 feet are now advised not to plant this strain.

This year, there have been several new strains under test. One of these is an extraordinary vigorous, large-flowered upright type bred by Mr. G. S. Powell at Elburgon. Unfortunately, however, it has a low pyrethrins content.

A second variety represents a composite mixture of several H.T. strains. This has yielded quite well, better than (14 × 24) but not so well as Powell's.

A small yield trial comprising ten H.T. strains was planted at Subukia to see if any of them were suited to a low altitude. It is too early to give a final judgment but some of them appear promising.

The work of breeding new strains has been continued in collaboration with the Senior Plant Breeder. This work has again been delayed owing to the difficulty of getting flower samples analysed for pyrethrins content in sufficient quantity. In addition to the routine records kept on the single plant selections at Ol Joro Orok and Molo, forty isolated plots were established for cross breeding. Several of these plots are devoted to the crossing of various H.T. strains with the vigorous Powell's strain mentioned above.

Several of the selections made in 1946 had a pyrethrins content of more than 2 per cent and a few of these appear to combine this characteristic with good growth in the field.

Ox Cultivation.—This trial has now been running for two seasons. Ox cultivation has not depressed the yield so far, thus showing that the *careful* use of an ox cultivator combined with hand weeding between the rows need not harm the plants.

Repeated Trimming.—Breaking off the dead stalks at intervals during the season as compared with cutting back once a year as is usually practised, has had no appreciable effect.

Rotation Trials.—In addition to the smaller trial planted in 1946, a second, more elaborate trial was planted this year. This trial was designed at Rothamsted and includes five rotations, with continuous pyrethrum as a control. The rotations under trial comprise one rotation of pyrethrum with cereals, three rotations of

pyrethrum and grass and one with a combination of pyrethrum cereals and grass. The grass plots were planted with *Bromus* grass and are grazed by native sheep. The cereal plots were planted with wheat.

This is a long term experiment and there are no results to report at present.

Seedlings v. *Splits.*—The results from these trials are not yet complete but the view expressed in last year's report that seedlings yield less in the first season and fail to make up for lost ground in the second season has not yet been modified.

Spacing.—In the last report figures were given showing that closer spacing, up to 2 in. by 1½ in., increased the yield. This result has generally been confirmed in the past season.

A new trial, testing much closer spacing, was planted this year, the closest spacing being 1 ft. 6in. by 9 in. It is too early as yet to give results.

Transplanting Skill.—In the last report, it was stated that differences in the skill of individual transplanters affected the yield in the first season. These differences have disappeared, however, in the second season.

It was found this year that the late planting of splits affects their yield, not only in the first season but in the second season also. The yield of seedlings, on the other hand, was not affected in the second year by late planting in the first year.

Weeding.—A trial was planted this year to test the effect of weeds in reducing yield. Preliminary results show that failure to weed properly affects not only the yield but the flower size and the stand also.

Ramularia (Bud) Disease.—This disease was briefly described in the last report. It occurred, for the first time in Kenya, in July, 1946, and the causative organism was later identified as *Ramularia bellunensis* Speg, a fungus which had been previously recorded on *Chrysanthemum frutescens* (Marguerites) in England but is a newcomer to Africa.

Experimental work this year has confirmed the field observation that some plants are comparatively resistant and it is probable that the most successful long term project for controlling the disease will prove to be the breeding of resistant strains.

Work has proceeded on the study of climate in relation to the disease. This has not yielded much so far and it will probably be difficult to assess the role played by climate until there is a general epidemic comparable to that which occurred at Molo in 1946.

A trial is in progress to test the effect of cutting back at various times on the incidence of the disease. Failure to cut back increased the amount of disease and the new growth after cutting back generally appears to be comparatively healthy. Observations are, however, incomplete and further study is necessary before drawing any definite conclusions as to the efficacy of this method of control.

Further observations on fertilizers gave negative results and this work has now been discontinued. Various sprays are still being tested but some trials had to be postponed until there was more disease on which to test the sprays.

Some work was done on finding a suitable inoculation technique so that new strains in the breeding plots can be tested for resistance. So far, no success has been obtained with artificial inoculations and it appears probable that the fungus is only a weak parasite.

Yields have been generally rather poor this year. This is considered to be mainly due to the poorly distributed rainfall rather than to the disease. Weekly

counts in the Molo area revealed the following amounts of disease, the diseased buds being expressed as percentages of healthy flowers plus diseased buds:—

Month	*Disease* %
January	22.6
February	22.6
March	10.3
April	8.6
May	4.5
June	1.9
July	0.9
August	9.3
September	2.9
October	4.6
November	9.5
December	6.2
Average	7.71

The high percentage in the first two months represents the aftermath of the 1946 epidemic. When the new season started, the percentage of disease dropped.

Other Pests and Diseases.—The Red Spider, first seen on pyrethrum in November, 1946, has not caused any damage although it still occurs on the crop.

A species of mite was observed on pyrethrum in May of this year and on several occasions since; it has not caused any appreciable damage however.

A beetle, *Lagria villosa,* caused some damage to flowers on a farm at Londiani but the attack was short-lived and did not spread.

Various cases of root rot, eelworm and flower diseases other than *Ramularia* disease were observed but there is nothing unusual to report.

Control of Thrips.—Some preliminary spraying and dusting trials were carried out on pyrethrum using lime sulphur, nicotine, and gammexane. The most satisfactory treatment was dusting with diatomite containing 1 per cent gammexane at a rate of 180 lb. per acre.

Petal-less Flowers.—Work carried out by the Pyrethrum Assistant showed that this condition is partly associated with dry weather. It is also partly a matter of heredity, some strains being particularly prone to this complaint.

Agricultural Machinery.—The Pyrethrum Board imported two mechanical transplanters, the "Quickstart" and the "Multiplanter". These arrived too late in the season for anything but the most superficial trial and it is hoped to test them more fully next year.

The Board also imported the Hauck Flame Gun for test. This implement proved disappointing for the eradication of weeds as it is expensive to run and not very effective.

General

High Toxic Seed.—Four hundred and forty-nine growers purchased seed derived from the 14 × 24 strain for replacing their existing pyrethrum with a high content strain. The seed was sold by the Pyrethrum Board through the Kenya Farmers Association. Germination and growth in the nursery were satisfactory on the whole.

Ramularia Disease.—As mentioned above, there has been no general outbreak this year comparable to that of 1946. The disease has been bad on some farms, but the attack has usually only lasted a short time and has then largely disappeared. The reason for these isolated attacks on certain farms or fields whilst adjacent pyrethrum is more or less unaffected, is not known but it is thought that the disease was generally worse where the plants had been previously

weakened by overbearing, poor drainage, poor soil, drought, etc. The fungus is not thought to be a strong parasite as it will not readily attack a healthy vigorous plant unless conditions are favourable to its spread.

Starting in the Molo area in July, 1946, the disease spread very quickly and by March, 1947, it had been found at Ainabkoi, Londiani, Mau Summit, Molo, Turi, Elburgon, Subukia, Ol Joro Orok, Eburru, Kinangop and Limuru. By September 1947, it had reached Nandi and Elgon. No case has been reported from Sotik and Nyeri/Nanyuki as yet, but no special search has been made in these areas.

P.A.R.A.C.—The Pyrethrum Agricultural Research Advisory Committee met four times. Their advice and assistance are gratefully acknowledged.

During the year, P.A.R.A.C. prepared a general guide for pyrethrum growers entitled "The Cultivation of Pyrethrum in Kenya" and this was published by the Pyrethrum Board.

Farmers' Days.—Farmers' days were held at Ol Joro Orok, Subukia and Molo in October, November and December. These meetings afforded a good opportunity to show farmers the work in progress and to discuss their problems.

Meteorological Records

Month	Molo				Ol Joro Orok			
	Rain Total	Humidity	Max. Mean	Min. Mean	Rain Total	Humidity	Max. Mean	Min. Mean
	In.	*Per Cent.* 8.30 a..m	*F.*	*F.*	*In.*	*Per Cent.* 8.30 a.m.	*F.*	*F.*
January ..	3·76	76	72.8	44·9	1·17	73	73·5	43·8
February..	1·90	76	73·1	42·8	1·07	60	76·6	42·5
March ..	3·26	75	70·1	45·5	6·84	79	71·1	45·7
April ..	12·65	88	67·9	48·5	8·22	74	69·8	46·3
May ..	8·38	86	66·8	49·0	4·54	88	71·2	45·3
June ..	5·69	82	66·5	44·6	3·00	87	69·7	43·1
July ..	6·86	88	64·5	46·4	6·73	87	67·5	45·8
August ..	3·75	87	64·2	44·4	7·01	86	65·9	44·7
September	4·56	78	67·7	42·5	4·26	75	69·7	41·3
October ..	1·48	71	69·6	42·4	1·19	62	71·5	41·9
November	0·55	75	68·6	43·6	0·75	72	69·6	43·4
December	3·32	80	67·0	43·9	1·72	76	68·9	44·7
	56·16	80	68·2	44·9	46·50	77	70·4	44·0

Month	Kinangop	Subukia
	Rain Total	Rain Total
	In.	*In.*
January	4·57	—
February	3·18	—
March	5·88	2·95
April	14·84	10·02
May	12·14	6·62
June	2·56	3·17
July	3·70	8·83
August	—	4·23
September	1·93	7·22
October	1·61	0·99
November	4·73	0·70
December	1·87	2·88

E. W. GADDUM,
Agricultural Officer (Pyrethrum).

ANNUAL REPORT OF THE AGRICULTURAL OFFICER (HORTICULTURE), 1947

Staff

European.—T. H. Jackson, Agricultural Officer (Horticulture) was on vacation leave from 9th May to 27th December.

Mr. Corkhill, Assistant Agricultural Officer, who was in charge of subtropical fruit nurseries at the Coast resigned during the year.

African.—Two Agricultural Instructors were transferred to Horticulture from the Seed Station staff.

Publications

An article on the cultivation of deciduous fruits entitled "The Home Orchard" was published in the East African Agricultural Journal.

Copies of this article are required by the East Africa Office in London for distribution to prospective settlers, in place of out of date literature which is being used at present. It is hoped to reprint the article as a departmental bulletin.

Seed Station, Turi

The Seed Station, Turi, was taken over from the Seed Specialist on his retirement, and was closed down in April.

Stocks of seeds were transferred to the Plant Breeding Station, Njoro; most of these have since been disposed of.

The seed cleaning plant was left in its original building, and during the year the plant was ably managed by Mr. J. W. Best of Turi.

Advisory work, and seed trials, are now carried on at the Horticultural Station, Molo.

Official Visits in England

During my vacation leave in England I paid official visits to the following institutions and firms:—

The Imperial Institute.
East Malling Research Station.
John Innes Horticultural Institute.
The Canning Research Station, Campden.
Royal Botanic Gardens, Kew.
The Royal Horticultural Society.
The National Fruit Trials.
The Metal Box Co.
Marshalls Food Products, Ltd.
Messrs. Suttons of Reading.
Messrs. Drake and Fletcher.
Messrs. Allen and Simmonds (Autoculto).

The Imperial Institute.—The export of trial consignments of fruit from Kenya to England was discussed with members of the staff.

East Malling Research Station.—A week was spent at East Malling, and during this time many technical problems were discussed with the staff.

The methods used for the vegetative propagation of rootstocks were studied, and arrangements were made for the dispatch of a further consignment of experimental rootstocks to Kenya.

The technique for the diagnosis of mineral deficiencies in fruit trees by injection was discussed with Dr. Roach.

The East Malling system of experiment recording was studied.

Kenya fruit pathological problems were discussed with Dr. Prentice, particularly "Flat Limb" of the Gravenstein apple, and a suspected virus disease of plums. The work being done at East Malling on virus disease of raspberry and strawberry was seen.

A visit was paid to the Commonwealth Agricultural Bureau.

Long Ashton Research Station.—A week was spent at Long Ashton. Cider and Perry varieties of apples and pears were studied, and arrangements were made to import some into Kenya for trial. The cider making plant was seen.

The diagnosis of mineral deficiencies in plants by means of tissue tests was demonstrated to me, but in my opinion this is more a laboratory than a field method and the apparatus is much more expensive than that required for the injection method. On the other hand the injection method requires more skill in diagnosis.

Very interesting work has been done at Long Ashton on delaying stored potato sprouting, by treating the tubers with a growth substance.

As potato storage is a perennial problem in Kenya, it is proposed to carry out some trials with this compound, at Molo.

The use of tomato setting hormones was discussed, and it is hoped to carry out trials of these also.

Much information on the latest developments in orchard implements, spraying machinery, etc., was obtained from Professor Kearns.

John Innes Horticultural Institute.—Dr. Lewis of the above Institute very kindly let me have some seed of raspberry varieties, and crosses, for trial in Kenya.

The importation of raspberry seed into Kenya is safer than importing canes, as the Raspberry Mosaic virus is not carried by the seed. It may also be possible, to select from among the seedling produced, types better suited to our climatic conditions than varieties which have been bred for the English climate.

The Canning Research Station.—The possibility of exporting Kenya canned fruits to England, and the kinds which would be most acceptable on the English market, was discussed with the staff.

I was informed that there was a large demand for haricot and pea beans, for canning in England, in order to replace supplies formerly obtained from America and the Argentine.

Royal Botanic Gardens, Kew.—The Director was interested to know what results had been obtained in Kenya with trials of *Chenopodium quinoa* seed, sent out from Kew.

Royal Horticultural Society.—Several Royal Horticultural Society lectures were attended; one by Professor Blackman on "Modern Methods of Weed Control" was most informative.

It was reassuring to hear that growth substances cannot remain in the soil for more than a few weeks without being broken down. This is a most important point where such weed killers are used in orchards, and other permanent crops.

A demonstration of hormone weed killers which I attended, showed a remarkable kill of weeds in turf.

The kill of plantains was almost 100 per cent, and of dandelions slightly less. It must be stated that very little rain fell between the time of application, and the demonstration, a period of two months. In my opinion this factor probably has a considerable effect on the kill of weeds obtained.

The National Fruit Trials.—The National Fruit Trials at Wisley, contains over 1,000 varieties of apples. This was the only place in England where I was able to see most of the varieties commonly grown in Kenya.

Mr. Potter, National Fruit Trials Officer, made a very helpful suggestion on the problem of "prolonged dormancy".

He told me that all the apple varieties, with one exception, which grow well in Kenya, are varieties which in England, did not ripen well except in a hot summer. He was able to tell me the names of other varieties with this characteristic, which have not been tried in Kenya. Arrangements were made with Mr Potter to import budwood of these varieties by air, for trial in Kenya.

The Metal Box Co.—A most interesting visit was paid to the Metal Box Company's factory at Acton, in company with Mr. J. R. Cox.

The can-making plant, and the canning machinery plant were visited. Modern methods of colour printing on tin were seen in the printing plant. This method is a vast improvement over the old stick-on paper labels, and local canners would be well advised to inquire into it.

Messrs. Sutton's.—A visit was paid to the seed cleaning plant, and seed testing laboratory.

The Kenya seed growing industry was discussed with Mr. Martin Sutton and other members of the staff.

Arrangements were made to carry out trials of Sutton's flower seeds at Molo, for seed production.

Observations on Farm Machinery in England.—Of the small market garden tractors, the "Trusty" appears to have the best reputation among growers. The set of implements offered with this machine are well designed, and of good quality.

The "Ferguson" tractor, which is a 4-wheeled tractor about 16 h.p., on rubber tyres, was very well spoken of by growers, and by the Research Stations, as an orchard tractor, and also for light farm work. The implements made for this tractor are extremely good. I would like to see one of these machines imported into Kenya for trial.

The Kenya Fruit Industry

The expansion of fruit growing is now such that additional staff is required to deal with the greatly increased volume of advisory work, and to enlarge the scope of research into local problems of fruit growing.

A large internal military market now exists, and supplies of fruit for this market are not meeting the demand. This situation is to be expected, and is likely to continue until new plantings come into bearing.

The planting of new acreage is still being delayed by the shortage of nursery stock. Several cases have come to light, where nurserymen have supplied trees of small size, which when planted out are very slow to establish themselves. Growers receiving such trees should plant them in a nursery on their own farms for a year. This will enable the trees to grow to a sufficient size to be able to withstand the more vigorous conditions of the orchard, when they are finally planted out.

A few progressive growers are now adopting proper methods of grading and packing their fruit. Fruits are graded for size, each fruit is wrapped in paper, and packing in the boxes is done on the diagonal row system. The greatly enhanced appearance of fruit properly packed, and the improvement in the condition in which it reaches the market, as compared to the old way of tumbling all shapes and sizes of fruit into any container that happened to be available, has to be seen to be believed. There is no doubt that the growers now adopting improved packing will reap the benefit of their initiative in increased demands for their products.

As a result of certain saw mills specializing in the production of box shooks, more growers are now using standard fruit boxes.

Investigational Work

During my absence on leave, essential work was carried on by Dr. U. Kroll, of the Molo Pyrethrum Station.

A number of fruit trees kindly donated by the Western Province Fruit Research Station, Stellenbosch, arrived, and one set was planted in the Molo orchard.

The trees consist of apples, pears, plums, apricots, and almonds, on experimental rootstocks and some on their own roots.

Another set of these trees will be planted at Ol Joro Orok in 1948.

The terracing of the Ol Joro Orok orchard, was unfortunately, not completed in time for the orchard to be planted this year. All the trees have arrived, and have been planted temporarily. They will be finally planted out in 1948.

Apples propagated by Mr. Sherwen on some of the East Malling rootstocks were planted at Molo.

The following were also planted at Molo orchard:—

Apples from Messrs. Pickstone's.

Plums on their own roots.

East Malling apple rootstocks.

Lemons and limes from H. L. Hall and Sons.

Mountain pawpaw.

Boysen berry, Young Berry.

A hedge consisting partly of *Lycium horidum* and partly of *Pyracantha angustifolia* was planted at the Molo orchard.

Work was started on the construction of a nursery at Molo to replace the Turi nursery, which will be closed down early in 1949.

The multiplication of the East Malling rootstocks by layering was continued at the Turi nursery.

The most promising rootstocks from the point of view of both ease of propagation, and growth, are Nos. 10 and 12 of the East Malling new immune series.

Some of the rooted layers from these stocks have made eight feet of growth in a year.

Subtropical Fruits

It has been decided to abandon the project for having subtropical fruit nurseries at Kibarani, owing to the impossibility of obtaining irrigation water at a reasonable cost.

It is hoped to establish the nurseries on the department's new farm at Digo.

APPENDIX A

Weather at Molo

Meteorological records at Molo for rainfall and temperature were as follows:—

Rain: total inches, 56.16; Humidity: per cent, 8.30 a.m., 80; Max. Mean F. 68.2; Min. Mean F. 44.9.

APPENDIX B

Imports of Fruits Through Kilindini

South African Apples ..	16,578 c/s. ..	Sh. 510,548
Other South African Fruit	11,778 c/s. ..	Sh. 159,519
Local Fruit	14,811 Baskets ..	116,015

Imports of Fruit Through Kisumu

	lb.
Musoma	5,252
Bukakata	5,818
Mwanza	181,417
Port Bell Kampala	1,416
Bukoba	397,425

Import of Fruit Trees Through Kilindini

344 bundles .. .. Sh. 58,451

Export of Kenya Seeds Through Kilindini

Vegetable and Flower Seed .. 573 cwt. valued at £3,616

T. H. JACKSON,
Agricultural Officer (Horticulture).

ANNUAL REPORT OF THE AGRICULTURAL OFFICER, (SISAL SERVICES), 1947

Staff

European.—Officer in Charge.—Mr. R. H. Pullen-Burry, Acting Agricultural Officer, 1st January to 6th November.

Mr. A. F. Nichols, Agricultural Officer, 7th November to 31st December.

Temporary Assistant.—Agricultural Officer.—Mr. K. Lerche, returned from leave and was re-engaged on 12th March.

Field Assistant.—Mrs. A. C. Liechti, 1st January to 31st December.

African.—One clerk and four recorders.

High Level Research Station, Thika

The routine work of recording the number of leaves, leaf lengths and fibre yields in the trials at the Station, fully occupied the African staff and absorbed a great deal of the time of the European staff. The cutting trial and the spacing trial are the two most important trials which are in progress at the present time. There are also interesting observation plots of hybrids and local sisal selections.

Approval was obtained during the year to start five external field trials—two to be laid out in the Thika District and one each in the Kitale, Nakuru and Voi districts. These trials will be the most comprehensive that have so far been undertaken by the Station. They will combine spacing of rows, plant density per acre, earliness of cutting and frequency of cutting and the design will be a 3^4 factorial experiment arranged in a 9 × 9 Quasi-Latin Square.

The planting of external trial areas will be done during 1948, but a great deal of preparatory work has been performed; sites have been selected and a nursery of about 70,000 bulbils has been established at the Station.

Some preliminary work on plant propagation was done by the Field Assistant.

Buildings.—Work was started on a new house for the Assistant Agricultural Officer Progress has been slow as it has been difficult to obtain materials and labour. It is anticipated that the house will be completed in April, 1948. All the work has been done by Africans under the supervision of the staff at the Station. As far as possible local materials have been used and most of the stone has been quarried at the Station.

An eight-roomed stone building for African labour was completed.

An electrically-driven Krupp Raspador was erected during the year to deal with sisal produced at the Station.

Labour shortage has severely handicapped work on the Station and a second-hand Farmall M. tractor was obtained during December. It has not so far been possible to obtain implements for the tractor.

This opportunity is taken to thank members of the Management Committee for their help and co-operation.

A. H. NICHOLS,
Agricultural Officer.

ANNUAL REPORT OF THE GRADING, INSPECTION AND COOL STORES SERVICES, 1947

Staff

Mr. Quiggin was gazetted Chief Grader and Inspector as from 1st January, 1947.

Mr. Beverly was gazetted Grader and Inspector as from 1st January, 1947.

Mr Quiggin returned from overseas leave on 10th March, 1947.

Mr. Sargent Superintendent Maize Conditioning Plant and Cool Stores proceeded on leave pending retirement on 31st July, 1947.

Mr. Taylor was gazetted Acting Superintendent Maize Conditioning Plant and Cool Stores, as from 1st August, 1947.

Mr. Muir, Foreman, was transferred from the Grain Conditioning Plant, Nairobi, to the Maize Conditioning Plant, Kilindini, on 1st August, 1947.

Miss Marsden, Clerk, was appointed on 4th December, 1947.

Mrs. Snell, Clerk, Temporary, resigned on 10th December, 1947.

Inspections

Exports.—The following Phytopathological Certificates were issued:—

Four certificates for 6,301 bags of Uganda chillies exported to Colombo.
One Certificate for 999 bags of Uganda gram exported to Colombo.
Three certificates for 6,218 bags of Kenya millet exported to Bombay.
One certificate for 298 bags of Kenya sunflower seed exported to U.K.

On three occasions certificates were not granted. Once in respect of trans-shipment maize from Portuguese East Africa, and twice in respect of Uganda chillies owing to the presence of storage pests.

Imports.—The following table shows the number of parcels of plant material and products and their declared values inspected at Mombasa:—

Class of Import	Imported		Refused Entry	
	Number of Parcels	Declared Value	Number of Parcels	Declared Value
		Sh.		*Sh.*
Seeds	2,742	303,283	4	246
Plants	24	1,242	6	24
Bulbs	—	—	15	516
South African Fruit ..	11,778	159,519	—	—
South African Apples ..	16,578	510,548	—	—
East African Fruit ..	14,811	116,015	—	—
Fruit Trees	344	58,451	2	400
Drugs	571	64,153	—	—
Food and Spices	44,178	3,480,356	—	—
Ground Nuts	9,225	422,546	—	—
	100,251	5,116,113	27	1,186

Six hundred and twenty-three packages valued at Sh. 27,283 were inspected and passed on behalf of Uganda, and 127 packages valued at Sh. 7,341 on behalf of Tanganyika Territory.

The total number of packages is lower than the previous year, though the declared values are higher. This is accounted for by a large increase in seeds and foods and spices, and a decline of almost 50 per cent in fruit. The large increase in seeds, more than four times the 1946 figure, is mainly due to the bulk importation of seed for reduplication and re-export. The decline in fruit imports from South Africa can only be accounted for by a shortage in South Africa of fruit for export to East Africa, as the demand is here and there are adequate shipping facilities. Much greater care has been taken in the selection of fruit for export to East Africa, with the result that there were no rejections.

The 1946 record August consignment of fruit trees was exceeded in 1947, 257 bundles valued at £2,277 were imported during the month of August. Very great difficulty was experienced in carrying out a proper examination of these trees owing to the extremely congested state of the Port area.

The bulk of the rejections is composed of bulbs and seed "Sweet Corn"; quantities of the latter continue to arrive by post, mainly from America.

Grading

Maize Grading.—No maize was released for export, except to coastal ports, until the end of April.

Grading Direct.—During April and May, 34,012 bags were received direct for grading. Of this total only 11,096 bags, mainly ex store Nairobi were found fit for classification of which 5,488 were Cusco. The remaining 22,916 bags, mainly from Taveta and Lumbwa were rejected as wet, weevily or both. By the end of May there was no more maize fit for grading in store, and it was decided to divert all maize for export to one or other of the conditioning plants for treatment.

In October the native crop from Nyanza began to come forward, and continued to arrive for grading till early December, when lack of shipping facilities brought the movement of maize to an end. More than 75 per cent of this crop was graded Third Grade, Slightly Weevily (K3SW).

Grading After Conditioning.—Maize was received for grading from both the Conditioning Plants after treatment from April until the end of the year. In September the Uganda crop began to arrive at the Coast. None of it was graded direct, as it was either wet, weevily or both. No exact figures for the grading of this crop are available, as some went straight to the Conditioning Plant, while some went into store waiting its turn to be treated, and there lost its identity. None was graded higher than Undergrade (K8C) whilst some of it was not graded after treatment but sent to the mills for local consumption. Owing to the extreme congestion of the Port area at Kilindini large quantities of maize had to be stored after treatment outside the Port area. This was inspected from time to time while awaiting shipment, and after a period of about six weeks the vast majority of it was found to have been reinfested with weevil, necessitating a further treatment at the plant

The following table shows the quantities received and graded from different sources.

	Direct	Ex. G.C.P. NRB.	Ex. M.C.P. KLI.	Re-inspected	Total
K2	1,496	—	—	—	1,496
K3	1,411	—	1,180	—	2,591
K3SW	40,353	—	—	—	40,353
K3C	—	900	2,725	—	3,625
K4	509	—	—	—	509
K8W	—	3,908	40,769	—	44,677
K8Y	917	—	—	—	917
K8SW	2,185	—	—	—	2,185
K8YSW	300	—	—	—	300
K8C	—	282,023	286,544	8,509	577,076
K8YC	—	—	4,524	—	4,524
Cusco	5,488	—	—	—	5,488
Total Graded ..	52,659	286,831	335,742	8,509	683,741
Wet	10,906	233	—	—	11,139
Weevily	20,324	—	—	—	20,324
Other Causes ..	163	13	1,800	—	1,976
Total Rejected ..	31,393	246	1,800	—	33,439
Total Received ..	84,052	287,077	337,542	8,509	717,180

Maize Shipments

Under Certificate.—No shipments took place until June, when there were two shipments to India. The next shipment was in August. From then to the end of the year there were several small shipments to Southern Rhodesia and two more large shipments to India.

The following table shows the certificates issued:—

Five certificates in respect of 25,061 bags K3 S W.
Twelve certificates in respect of 84,091 bags K8 C.
Five certificates in respect of 404,135 bags K8 C Bulk.

Under Rule 25.—The following table shows numbers of bags and destinations of ungraded maize for local ports:—

38,110 bags to Dar es Salaam.
11,323 bags to Seychelles.
19,442 bags to Tanga.

Beans

Commercial Beans, Grading.—Three different types of beans were presented for grading. In July two large parcels of soya beans were presented by the East African Cereals Board. In September a quantity of 1946 or earlier crop of white haricot beans were released and offered for tender. Later in the year discarded Tanganyika seed beans were presented as mixed commercial beans.

The following table shows the quantities and grades:—

	K2	K3	K5	Total Received
Soya Beans	4,867	5,808	—	10,675
White Haricot	—	5,106	810	5,916
Mixed Beans	—	—	1,506	1,506
Total	4,867	10,914	2,316	18,097

Commercial Beans, Shipments.—Under certificate. The following certificates were issued:—

Eight certificates in respect of 2,892 bags K3 white haricot.
One certificate in respect of 4,867 bags K2 soya beans.
One certificate in respect of 5,808 bags K3 soya beans.

Under Rule 15.—The following quantities of beans were shipped to local ports:—

622 bags to Tanga.
4,313 bags to Zanzibar.

Seed Beans, Grading.—On only one occasion was this section asked to grade a consignment of seed beans from Tanganyika; it comprised 130 bags of Canadian Wonder beans, which were classified Second Grade (K2).

Seed Beans, Shipments.—One certificate was issued in respect of 150 bags K2; eighty-one certificates were issued in respect of 6,654 bags of ungraded seed beans.

Potatoes

Potatoes, Grading.—The potatoes presented for grading at the beginning of the year were of a higher quality than that seen for some considerable time, especially those from Karatina and Uplands. The skins were firm and there was little sign of rot, which indicated that efforts were being made to market potatoes of a better quality. The improvement was maintained until April, when the quality showed a decided deterioration, and bacterial rot began to become prevalent.

From then till July the quality steadily deteriorated, in which month the export of potatoes came to a complete stop and had not begun again by the end of the year, owing to the Colony-wide shortage of potatoes.

Forty-three thousand, three hundred and fifty-three hundred-weight were received for grading of which 42,233 cwt. were classified second grade (K2) and 1,120 cwt. were rejected.

Potatoes, Shipments.—The only shipments of note were to Colombo and Mauritius. These took place between March and May. Although the potatoes were packed in crates for three shipments towards the end of the season, very extensive hand-picking was necessary to eliminate rotting and infected tubers.

The following table shows quantities in hundred-weights and destinations of the potatoes exported:—

Destinations	*cwt.*
Colombo	12,083
Dar es Salaam	10,614
Lindi	166
Mauritius	10,408
Seychelles	1,186
Tanga	40
Zanzibar	7,713
Total	42,210

Ships Stores.—4,303 cwt. were exported as ship's stores.

Wheat

Wheat Grading.—Wheat began to arrive at the Coast for grading in March, and continued until August. The wheat generally was of a high bushel weight as almost 80 per cent of it was graded (K1). Seeing that arrivals continued late into the season, the proportion of weevily wheat was not excessive.

The following table shows the quantities in bags received and graded:—

	Graded Direct	Graded after Treatment at M.C.P.	Totals
K1	103,915	26,935	130,850
K1SW	23,529	—	23,529
K2	14,574	1,880	16,454
K2SW	6,179	—	6,179
K3	2,911	193	3,104
K3SW	470	—	470
Total Graded	151,578	29,008	180,586
Weevily	12,068	—	12,068
Wet	659	—	659
Other Causes	1,052	—	1,052
Total Rejected	13,779	—	13,779
Total Received	165,357	29,008	194,365

Wheat, Shipment.—Under certificate: the first shipment of wheat left in April and was destined for India. Apparently there was some misunderstanding in India about the seeds of *Datura stramonium* in Kenya wheat, as when the second shipment was graded, and awaiting shipment, instructions were received that the grain must be treated for the extraction of datura seed. Machinery was brought down to the Coast, and installed in No. 5 Transit Shed, where the wheat was treated. This held up shipments considerably, adding to the congestion of the port and proved another complication in obtaining casual labour in the port. Further shipments of cleaned wheat took place in June, July and August.

The following certificates were issued:—

8	Certificates in respect of	133,438	bags	First Grade K1.
3	„ „ „ „	11,552	„	„ „ Slightly Weevily, K1 SW.
5	„ „ „ „	16,149	„	Second „ K2.
3	„ „ „ „	3,127	„	„ „ Slightly Weevily, K2 SW.
4	„ „ „ „	2,306	„	Third „ K3.
1	„ „ „ „	2,800	„	K1, K2 and K3.
24		169,372		

The reason why the total amount shipped falls short of the total amount graded is because shipments were delayed owing to lack of shipping and much of the slightly weevily wheat became weevily during this time, and had to be cleaned at the plant. It is also due to losses incurred in the extraction of Datura seed.

Local shipments under rule 22:—

838 bags to Dar es Salaam.

3,931 bags to Mogadishu.

Conditioning

Maize Conditioning Plant, Kilindini.—The conditioning plant started work in February on some small consignments of beans and cow-peas. This work continued into March when some mtama was treated as well. A heavier conditioning programme started in March treating wet and weevily wheat, and by the end of the month No. 1 plant was working fairly regular twenty-four-hour shifts. In April this work came to an end, but at the end of the month a programme of treating weevily maize started which continued to the end of the year with only occasional interruptions for consignments of beans and wheat. This programme necessitated running both plants continuous twenty-four-hour shifts. Considerable difficulty was experienced at first in obtaining sufficient labour of the right sort. As the port was extremely busy at the time, most of the labour used to this type of work was employed there, and as it was over a year since both plants had operated twenty-four-hour shifts, much of the labour then employed had found regular employment elsewhere ,or left the Island. There was no shortage of labour, but the vast majority of those looking for work were either physically unfit to do the work or disinclined to attempt a job requiring so much physical effort.

No. 2 boiler was retubed during the year. While repairs were being carried out on this boiler, the plant was operated on No. 1 boiler, which worked satisfactorily until work on No. 2 was completed, when it developed defects which took considerable time to diagnose and rectify. At the end of the year both boilers were working satisfactorily.

Much time was lost due to the chronic congestion of the port and the extreme shortage of covered rolling stock and tarpaulins for open wagons.

The following table shows the quantities of grain treated during the year:—

	Bags
Maize	353,157
Beans	20,399
Cow Peas	6,762
Wheat	30,079
Mtama	2,638
Moong	128
Total ..	413,163

Working times:—

	Odd Shifts. Total Hours.	*12-hour Shifts.*	*24-hour Shifts.*	*Total Hours Less Time Lost.*
No. 1 Plant ..	130	39	202	5,405
No. 2 Plant ..	28	39	150	3,930

Grain Conditioning Plant, Nairobi.—The plant was in operation on one eight-hour shift only at the beginning of the year until the middle of February, when it closed down. The plant started again towards the end of April, and by the end of the month had worked up to full-time working, and so continued till the end of the year.

Maize was the only produce treated at Nairobi during the year. The majority of the maize was from store, and extremely weevily. A fair proportion of this maize was railed to the Coast for shipment, and was inspected there before being exported.

In passing it is worth mentioning that both conditioning plants suffer from same defect in dealing with very weevily maize. A further cleaning stage is desirable to remove the dust shaken out of the grain while passing through the drying stages. This would considerably improve the appearance of the final sample, and should not be very difficult to instal.

Work Done.—383,600 bags of maize were received for conditioning during the year.

Actual working time: 5,818½ hours.

Fumigation

Fourteen thousand, nine hundred and twenty-nine bags of produce were treated in 103 operations, details of which are shown below:—

975 bags commercial beans in 6 operations.

10,007 bags seed beans in 64 operations.

3,947 bags other produce in 33 operations.

Carbon tetrachloride ethylene dichloride was used for the greater part of the year until a supply of carbon bisulphide became available. The latter fumigant has proved more satisfactory because far less liquid is required to generate a lethal concentration of gas, and consequently a sufficient concentration of gas is built up more quickly.

The amount of "other produce" treated is much higher than in normal seasons, and is due to having to treat in this manner mtama, cow peas and other leguminous food crops which would normally have been treated at the

conditioning plant, but which the latter was too busy on maize for export at the time to receive. Further contributory factors are the increased unwillingness of certain shipping companies to accept produce unless it is certified free from grain and storage pests, and the pressure brought to bear by the Port Administration on those shippers, who were using the transit sheds as storage-warehouses, to have their produce removed from the port area.

Cool Stores

The following table shows the total quantities of and the revenue earned by various commodities deposited in the cool stores during the year:—

Commodity	*Quantity*	*Revenue* Sh.	cts.
Mutton	108,738 lb.	6,087	09
Beef	341,854 „	15,551	82
Pork	169,156 „	11,530	58
Offal	48,415 „	3,104	92
Bacon	167,920 „	7,182	91
Cheese	43,348 „	1,713	45
Fruit	1,305 „	126	56
Poultry	301 doz.	1,152	13
Fresh Fish	54,371 lb.	2,012	01
Cured Fish	17,543 „	923	02
Miscellaneous	5,551 „	449	43
Local Butter	824 c/s.	1,871	40
Butter Store	45,686 „	21,774	18*
Totals ..	3,781,248 lb.	Sh. 74,479	50

* Includes Rent of Butter Store.

Average space occupied:—

General Store	58.3
Butter Store	57.1

The total weight stored represents an increase of 8.1 per cent on the previous year, itself a record, but as the Bulk Butter Store is responsible for this by an increase of 50 per cent it is not surprising that revenue fell by about 25 per cent. This is substantiated by the figure for average space, which fell from 65¾ to 58½ in the case of the General Store but rose from 37 to 57 in the case of the Butter Store.

Due to further reductions in military personnel, which have not been offset by the more recent arrivals, and to the scarcity of meat and pork products towards the end of the year, all commodities with the exception of cheese and fish show a marked decline.

The large increase in deposits of fresh fish, from 5,125 lb. in 1946 to 54,371 lb. in 1947 is not a truly accurate comparison, as space was not made available for fish until October, 1946. For the most part this fish has been from Ocean Fisheries at Shimoni. The deposits have fluctuated considerably from 920 lb. in August to 11,182 lb. in November as this new venture overcomes some of the initial difficulties, such as strikes of fishermen, disappearance of fish from the area during the rains and wash-aways on the road.

Importations of fruit, as noted earlier under Inspection, have been on a very much reduced scale, with a consequent fall in the demand for space at the cool store. Many requests for space have been made, usually far in excess of that actually required, and as frequently not made use of.

The plant continued to function satisfactorily, but on account of the impending closing of the store certain repairs and replacements were not effected, which would otherwise have been carried out. The Peterbrotherhood compressors carried the whole load, working one at a time in a thoroughly reliable manner, and are a credit to the mechanical staff who tend them. The only stoppages were due to interruptions in the power supply.

Finance

Financially the year was satisfactory, every branch of the service, except Plant Inspection which is virtually non-revenue earning, showing an excess of revenue over expenditure, including the Conditioning Plant at Nairobi, which shows a profit for the first time since the inception of this service. The situation is all the more satisfactory in view of the increased costs of labour and coal, and taking into account the fact that it has not been found necessary to increase the charges for these services, with the exception of the heat treatment of bags at Kilindini, which was being carried out at a considerable loss.

In Appendix C the figure for Sundries includes £350 for repairs to No. 1 boiler, and in Appendix E under Sundries is included £57 for repairs to an electric motor.

Acknowledgments

The thanks of this section of the Department are due to the Port Administration, the traffic staff of the Kenya and Uganda Railways and Harbours and the Kenya Landing and Shipping Co., Ltd., for their continued assistance and co-operation; to the Port Administration for providing space when no space was available, to the traffic staff for providing rolling-stock when there was an acute shortage, and to the Kenya Landing and Shipping for getting trucks loaded and placed in time under the most difficult conditions.

P. M. QUIGGIN,
Chief Grader and Inspector.

APPENDIX "A"

GRADING, 1947

EXPENDITURE				REVENUE			
	Sh.	*cts.*	*Sh.* *cts.*				*Sh.* *cts.*
SALARIES:—				GRADING:—			
Graders and Inspectors ..	12,483	47		Maize	84,052 bags at	5 cents each	4,202 60
Clerks	2,419	65		Maize	633,128 ,, ,,	3 ,, ,,	18,993 84
Africans	2,682	11		Beans	18,227 ,, ,,	5 ,, ,,	911 35
			17,585 23	Potatoes	43,353 cwt. ,,	10 ,, ,,	4,335 30
SUNDRY EXPENSES:—				Wheat	194,210 bags ,,	6 ,, ,,	11,652 60
Grading	459	63					
Fumigation	977	19		MOISTURE TESTS ..	2 ,, at	5 Sh.	10 00
LABOUR (FUMIGATION)	1,016	02					
			2,452 84	OIL TESTS:			45 00
TRAVELLING			870 18				
				FUMIGATION ..	14,929 bags at	20 Sh. per op.	2,060 00
			20,909 25				
Plus Excess of Revenue over Expenditure			21,301 44				
			42,210 69				42,210 69

APPENDIX "B"

PLANT INSPECTION

EXPENDITURE			REVENUE	
	Sh. cts.	*Sh. cts.*		*Sh. cts.*
SALARIES:—			Phytopathological Certificates	85 00
Graders and Inspectors ..	8,708 78		Balance, being Excess of Expenditure over Revenue	12,026 45
Clerks	2,419 65			
Africans	198 50			
		11,326 93		
TRAVELLING	784 52	784 52		
		12,111 45		12,111 45

APPENDIX "C"

CONDITIONING (KILINDINI), 1947

EXPENDITURE				REVENUE			
	Sh.	*cts.*	*Sh.* *cts.*		*Sh.*	*cts.*	*Sh.* *cts.*
SALARIES:—				CONDITIONING:—			
Graders and Inspectors	5,487	25		Maize .. 116,253 bags at 50 cents	58,126	50	
Superintendent Mechanic (E), including Acting Allowance and Foreman	23,736	35		Maize .. 236,904 ,, ,, 60 ,,	142,142	40	
Clerks	2,419	64		Beans .. 20,399 ,, ,, 70 ,,	14,279	30	
Mechanic (Asian) including Overtime	10,110	41		Cow Peas 6,762 ,, ,, 60 ,,	4,057	20	
Africans, including Overtime ..	7,505	79		Wheat .. 30,079 ,, ,, 60 ,,	18,047	40	
				Mtama 2,638 ,, ,, 60 ,,	1,582	80	
				Moong 128 ,, ,, 60 ,,	76	80	
			49,259 44				238,312 40
TRAVELLING			1,015 50	HEAT TREATMENT .. 229,639 bags at 2 cents			4,592 78
				188,440 ,, ,, 5 ,,			9,422 00
SUNDRY EXPENSES:—							
Casual Labour	64,694	06					
Heat Treatment (Labour) ..	6,009	50					
Power	10,419	54					
Water	3,850	25					
Fuel	60,834	86					
Sundries	17,542	62					
Rent of Siding	2,350	32					
			165,701 15				
Balance being Excess of Revenue over Expenditure			36,351 09				
			252,327 18				252,327 18

APPENDIX "D"

Conditioning (Nairobi), 1947

Expenditure	*Sh.* *cts.*	*Sh.* *cts.*	Revenue	*Sh.* *cts.*
Salaries	116,894 00		Conditioning:—	
Travelling	16,711 00		354,964 bags at 70 cents each	248,474 80
Upkeep and Labour	85,052 65		Sale of Gunny Bags	2,475 35
		218,657 65		
Excess Revenue over Expenditure		32,292 50		
		250,950 15		250,950 15

APPENDIX "E"

Cool Stores, 1947

Expenditure	Sh. cts.	Sh. cts.	Revenue	Sh. cts.	Sh. cts.
Salaries:—			Storage Charges		54,479 50
Manager	4,865 44				
Superintendent Mechanic and Acting Allowance	19,696 34		Rent of Butter Store	20,000 00	
Overtime	950 78		*Less* Rent of Godown ..	2,400 00	
Clerks	3,971 82				17,600 00
Mechanic (Asian)	13,255 08				
Africans	4,644 79				
		47,384 25			
Travelling		1,410 20			
Sundry Expenses:—					
Power	14,332 10				
Water	558 00				
	Sh. cts.				
Ammonia	555 18				
Less Refund on Empty cylinders	536 00				
	19 18				
Sundries	3,814 70				
Mechanical Repairs	1,145 26				
		19,869 24			
Balance being Excess of Revenue over Expenditure		3,415 81			
		72,079 50			72,079 50

APPENDIX "F"

SUMMARY, 1947

SERVICE	EXPENDITURE	REVENUE	PROFIT	LOSS
	Sh. cts.	*Sh. cts.*	*Sh. cts.*	*Sh. cts.*
GRADING	20,909 25	42,210 69	21,301 44	—
PLANT INSPECTION	12,111 45	85 00	—	12,026 45
CONDITIONING :—				
Kilindini	205,149 62	252,327 18	36,351 09	—
Nairobi	218,657 65	250,950 15	32,292 50	—
COOL STORES	68,663 69	72,079 50	3,415 81	—
TOTAL ..	525,491 66	617,65252	93,360 84	12,026 45

STATEMENT OF BALANCES AS AT 31ST DECEMBER, 1947

GRADING AND CONDITIONING COMBINED

Combined Debit Balance as at 31st December, 1946 : Sh. 75,891 86 Nett Profit : Sh. 81,334 39

	Sh. cts.
Profit on Grading, 1947	21,301 44
Profit on Conditioning (Kilindini), 1947	36,351 09
Profit on Conditioning (Nairobi), 1947	32,292 50
Sh.	89,945 03

Combined Credit Balance as at 31st December, 1947 ; Sh. 13,963 47.

ANNUAL REPORT OF THE EGERTON SCHOOL OF AGRICULTURE, 1947

Accommodation

European.—The aim from the beginning was to provide accommodation for approximately twenty-four students with their wives and children, for twenty-four couples and for forty-two single men, that is for a total of ninety men, forty-eight women and about forty-eight children. This aim was achieved in 1947 by the continuation of the extension of "C" Block and by the retention of the Njoro Hostel. In November it was decided to close the Njoro Hostel at the end of February, 1948, and to accommodate the twelve families with children living at the hostel in cottages in the vicinity of "A" dining hall at the school. Work on these twelve cottages together with three staff cottages near them, a children's dining room, a playground, three earth closet blocks and one bathroom block was commenced early in December, 1947, and incidentally was sufficiently far advanced by the end of February, 1948, to enable the hostel to be closed on time.

Other bulidings completed were "C" block, comprising forty rooms mostly in pairs with communicating doors, bathrooms and earth closets; the old "A" kitchen was converted into offices and storerooms and work was commenced on the extension of the "C" block kitchen; the kitchen for "A" dining hall; and one class IV staff house.

African.—More cottages, latrines and washhouses were built in the school camp. No. 3 camp was begun, eventually to replace the old riverside camp. An African clinic hut was built. African accommodation on the farm is referred to under head "Farm".

Accommodation for Tuition.—The need for an assembly hall is increasingly felt. In 1947 the laboratory was brought into use as a place for lectures. When required the new library was so used also. The "A" dining hall will have to be used for lectures to large audiences in 1948. A fourth lecture room, now used for the temporary accommodation of builders' men will become available in 1948.

Office Accommodation.—Office accommodation is inadequate. It is proposed, in 1948, to build a mud and wattle block as a temporary measure.

Furniture.—Increases in the stock again had to be made.

Water, Sanitation, Heat, Light and Power

Water.—After discussion with the Hydrographic section of the Public Works Department it was decided to bring the top farm storage tank into use as a reserve for the whole station by by-passing the bore-hole on the line from the top tank to the sedimentation tanks. The bore-hole was brought into use in 1947, powered by electricity plus an auxiliary oil engine for emergency use. The position now is that 1,400 gallons of purified water can be supplied daily. That quantity is adequate for immediate needs. The potential capacity is about 30,000 gallons of purified water daily obtained from river and bore-hole if the supply system were modified. Lack of piping has delayed the watering of farm paddocks.

Sanitation.—The installation at present is:—

"A" block: Water borne.
"B" block: water borne.
"C" block: earth closets.
"D" block: earth closets.
"E" block: earth closets.
Detached staff quarters: water borne or earth closets.
African quarters: earth closets.

It is not intended to alter arrangements for "D" and "E" blocks but it is intended to convert staff quarters and "C" block to either water borne sanitation or chemical sanitation, probably in 1948.

Heat.—Electric fires in married quarters have not yet been installed owing to lack of equipment and fittings. Heating is at present provided as under:—

Married quarters (students): oil stoves.

Quarters for single men (students): no heating.

Staff quarters: wood fires or oil stoves.

Common rooms: wood fires.

Light.—More than half of "C" block and all of "E" block are not fitted with electric light yet owing to lack of certain fittings. This is an inconvenience.

Power.—Electric power was carried to the metal workshop.

Training Equipment

Farming Equipment.—This was considerably increased, notable items being three milking machines (two were presentations) and milk processing equipment. The farm itself, now being more fully developed, provides wider scope for training. The construction of a small bacon factory should also be noted under this head.

Workshop Equipment.—Some more tools for both metal and wood shops were secured but tools are still inadequate. Some useful heavy equipment was obtained for the metal shop.

Library.—The library was again enlarged and now is of considerable value to the students.

Synopses.—The issue is increasing gradually. A comprehensive set is now available to the students as an elementary approach.

Veterinary Equipment.—Much has to be added. It is hoped to improve equipment for this section in 1948.

Periodicals.—The more useful technical publications were again supplied in the common-rooms.

Training

Agricultural Certificate Courses.—The first of these, begun in 1946, was completed in February, the examination being voluntary, even for settlement candidates. The average number in training was forty-five. The second of these courses began in March and ended in November, the examination being made compulsory for all except private students. The average number in training was sixty. Numbers given do not of course include wives and children, in residence.

The Short Refresher Courses.—These courses, designed for established farmers and for pupillage settlement candidates, were not began until January, 1948, although it had been intended to hold one in November and December, 1947.

Special Courses.—A number of special short courses in such subjects as milking, pig rearing, cheese-making were held for private students.

The Diploma Course.—*See* note under heading "Future Policy".

Course for Wives.—All students' wives were admitted free of charge to the Agricultural Certificate Course and were given additional instruction in one or two extra subjects also free of charge. The course for wives is voluntary; attendance was better on the second than on the first of the Agricultural Certificate courses.

Notes on Candidates.—On the Agricultural Certificate Courses, settlement candidates, Government officers and private students were accepted. On all courses unsatisfactory students were reported on to the appropriate authority. The majority worked well and on the whole are of a kind which will be an asset to the Colony and which it was a pleasure to train. I feel it necessary to note, however, that I feel more convinced now than I did in 1946 that there is among

the settlement candidates a rather too high percentage of the kind of man who will not make a good farmer and who will not in fact be an asset to the Colony whatever he does. These few have I think left England to escape the rigorous conditions of living which they now find there and in some cases I do not think that their eventual intention is honestly to farm but, having arrived in Kenya on a pretext, to do whatever suits them later. The impression is gained that they consider that a beneficent Government should provide all for them; they certainly take everything they can get with little thanks. Despite a reduction in the will to work in England—and this reduction is noticeable in the case of some of our candidates—that country is still peopled by as fine a race as ever it was; one cannot help feeling that those of whom I am speaking are some of the no-goods who would sink if they stayed at home. Inevitably, problems, mainly psychological, arise in a community such as ours, of men, women and children, many of whom are suffering from the reaction of an after-war period. It is worth recording that few of these problems remain unsolved on the courses and that those few are created by the type of person referred to in the preceding paragraph, that is, by individuals who would respond unfavourably to any treatment, however forbearing.

Training Method

There was no change in syllabuses except that that for students' wives was added to and now covers a wide field. The syllabuses of the Agricultural Certificate, the refresher and the wives' courses are attached to this report for information.

The co-ordination of practical with theoretical instruction was possible to a greater extent in 1947 than in 1946 because for the first time it was possible to run a course beginning and ending at the right time of year. The basic rule of instruction that not more than twelve men and in many cases not more than six men should be given practical instruction at one time was followed with practically no exceptions. This put a greater strain on the staff but the results were worth it.

Tours of farming areas were conducted as an extension of training at the school and to acquaint settlement candidates with farms available under the scheme.

Students' Welfare

The students' committee in co-operation with the staff successfully organized rugby football, tennis, hockey and cricket practices and matches; in fact the school did very well in the field of sport during the second Agricultural Certificate course. Dances were held at intervals and were a popular means for students to return hospitality which they had received from friends outside the school. Non-technical cinema films were presented at the school at approximately fortnightly intervals by a travelling company.

Those students in the settlement scheme who were likely to have insufficient capital on entry to their farms after pupillage and/or training were able to obtain bursaries through the Director of Training to cover all or part of their own, and, if need be, their family expenses at the school.

Thanks are due to the Hon. Mrs. Grant, the D.V.P. of the E.A.W.L. for the unfailing interest which she took throughout the year in the happiness and general welfare of students' wives.

Land Development

No new land was cleared in 1947. At the end of 1946, only thirty-five acres remained to be cleared; the farm programme will necessitate the use of a portion of that land in 1948.

Development of the estate as a whole progressed and reference is made to it under several headings in this report.

Extension Work

Members of the school staff addressed one or two farmers' or district association meetings by invitation in the Nakuru District and many visitors were shown round the school and farm. Members of the staff were asked to give advice either by letter or visit, particularly on problems of pig rearing and dairy technology. The proposal to hold organized farmers' days at the school in 1947 was abandoned on account of shortage of staff but a programme was arranged for a visit of the local Young Farmers' Club which many established farmers in the Nakuru-Molo area attended.

The school Veterinary Officer was responsible for district veterinary work in the northern part of the Nakuru District up to the time in March when Mr. Macaulay vacated this post. On Major Tremlett's appointment to the post in August, responsibility for outside veterinary work ceased.

School Farm

General.—Wet conditions tended to depress crop yields and the butterfat content of milk. Rainfall in 1946 was 42 inches; in 1947 it was 65 inches. Yields were, however, on the whole not unsatisfactory, the average yield of wheat being over seven bags per acre, that of maize being eleven bags per acre, that of barley over eight bags per acre.

Acreages:—

Temporary grassland	240
Plough land	240
Permanent grass, undeveloped land and trees	150
Lucerne	10
Pyrethrum–grass rotation	20
Uncultivable and rough grazing	90
School, houses and grounds	50
Total acreage of estate ..	800

The Arable Rotation and Manuring Plan.—The scheme, described in previous reports, was further developed, a proper balance between temporary grassland and land under the plough being for the first time achieved. The manuring plan is based on the fertilization of the temporary grassland by grazing animals, by the application of farmyard manure and by phosphatic manuring. Apart from that use, farmyard manure is only used as a direct dressing for maize, which provides for students a demonstration of its noteworthy effect on maize growth, and for field onions and garden vegetables. All cereal crops and maize are now regularly given a phosphatic top dressing of guano and rock phosphate, or an equivalent mixture. This phosphatic dressing has been most beneficial.

Peas, after silage maize, as a catch crop, giving soil nitrogen and a useful food for labourers and a protein food for pigs, were tried successfully.

Boundary fences of fields were erected as required for grazing control and an experiment was made with electric fencing for paddocking in field 4, while under temporary ley. It is proposed to make use of electric fencing for paddocking in 1948.

It was impossible to carry water to paddock troughs on account of the shortage of piping. So far the effect of this deficiency is not great.

The cropping plan is based on—

(*a*) live stock and human food needs; and

(*b*) the production of cash crops, which is of secondary importance;

it is arranged to provide as far as possible for the maintenance of soil fertility between the ley courses. Two important parts of the plan are the growing of maize for grain or silage immediately after a temporary ley and the taking of cereal crops after the maize course.

Establishment of Grass Leys.—The methods tried have been—

(*a*) Star grass under maize;

(*b*) Rhodes grass or *Bromus marginatus* under a cereal;

(*c*) Rhodes grass, Star grass or *B. marginatus* planted without a nurse crop;

(*d*) Rhodes grass, Star grass or *B. marginatus* with a light sowing of oats as an attraction for early grazing.

The comparative value of these four methods has not been investigated on a statistical basis on this farm yet. From observation of results it appears that (*b*) is less satisfactory than (*c*) or (*d*). The comparative effect of (*c*) and (*d*) may become apparent in 1948, later in the life of the leys. Method (*a*) has only been used in the early stages of getting the rotation going; it is not intended always to grow maize at the end of the plough courses.

Small trials of exotic grass species are in being.

Considerable benefit may result from the early attraction of grazing animals to young leys under conditions here.

B. marginatus did very well in 1947 but it was an exceptionally wet year.

The carrying capacity of the better leys is estimated to be one beast to an acre and a quarter in the rainy months; the natural carrying capacity of rough grazing in this area is about one beast to seven acres.

Pyrethrum Rotation.—Part of the new land was planted with high toxic strain seedlings. The last part of the old land was discarded at the end of the year and has come into the arable rotation.

Soil Conservation Measures.—The broad-base terraces and "O" roads stood up well to the heavy rainfall of the year. Together with the long-term effect of ley farming, these mechanical means should, within a few years, result in the improvement of the fertility of this comparatively steeply sloping land, the soil of which tends to lack good structure at present.

Trees.—All inter-field shelter belts are now planted with the exception of those between fields 13, 14 and 15.

Produce Sold.—Dairy produce, including cheese, pig products, poultry products, sheep, wool, bullocks, wheat, pyrethrum and vegetables.

Crop Production:—

	Acres	
Maize grain	75	11 bags per acre
Maize silage	14	12 tons per acre
Barley	60	8.35 bags per acre.
(Glacier and Prior were grown as well as our own feed barley. Prior lodged badly in the heavy rain; Glacier withstood the rain far better.)		
Wheat 291J	28	6 bags per acre.
Wheat 117A	15	8 bags per acre
Wheat Regent	18	8.5 bags per acre
(Leaf rust was prevalent.)		
Oat grain	25	9 bags per acre
Oat hay	15	2 tons per acre
Linseed	6.5	3 bags per acre
Pyrethrum	14	450 lb. per acre.
Field peas. Catch crop	14	
Field onions	¼	

The Grade Dairy Herd.—The aim is to keep on the farm a grade Friesian, a grade Ayrshire and a small Boran herd, the last-named being required to illustrate the differences between native and European breeds and to be available for grading up and back crossing. An earlier policy was eventually to do away with the Friesians but it has been recently decided to retain them as well as the Ayrshires to show more than one breed to students. Pedigree Ayrshire and Friesian bulls are kept. More home-bred heifers came into milk during the year; culling was continued.

The herd numbers are as under, the previous year's figures being given for comparison.

	On 31-12-46	*On 31-12-47*
Cows	55	67
Heifers	49	52
Heifer calves	15	22
Total female stock	119	141
Bulls	3	3
Bullocks	32	30
Young bullocks	13	17
Bull calves	7	21
Total male stock	55	71

With the increase of better temporary grassland it is noteworthy that the carrying capacity of the farm has greatly increased.

The average lactation (300 days) over the whole herd except Boran was 609 gallons.

The total production of milk was 28,600 gallons.

The average butter fat content except Boran was 4.0 per cent in a wet year.

Daily production averages excluding Boran were as under:—

	lb. per Cow
January	25.3
February	18.7
March	19.9
April	20.6
May	20.1
June	21.3
July	18.9
August	20.9
September	17.4
October	17.4
November	17.4
December	17.1

Daily herd average was 20.3 lb. per cow over the whole year.

Of the milk produced, 11,680 gallons were sold as whole milk; 714 gallons were sold as cheese; 4,205 gallons were sold as butterfat and 12,000 gallons were sold as butter.

Both milking machines and hand milking were used. A full year's reserve of both oat hay and maize silage has been established so that at the end of a dry season there is still enough for the subsequent year, including the dry season, should crops fail in the ensuing season. Dairy equipment was increased to enable more adequate instruction in all sides of dairy technology to be given.

Silage Production.—Both pit and trench silos are in use, the latter being dug at points about the farm near to fields, as cartage after making is less costly than cartage before making.

Pigs.—The demand for the school's pedigree Large Whites for breeding purposes continued to increase. More animals of our own breeding were registered in the herd book. Importations from the United Kingdom by the P.I.B. were, on the whole, disappointing.

Plenty of barley was available from the farm for feeding and the good type of baconer produced in previous years was maintained. One hundred and thirty-two pigs, including both breeding stock and baconers were sold in 1947. Ham and bacon curing were commenced mainly for purposes of tuition but a ready sale was found for the products.

So far the policy has been to concentrate on the production of baconers and baconer breeding stock. It is intended in 1948 to bring in a porker type as well to widen the sphere of instruction.

The new fattening pens were nearly completed but difficulty in obtaining certain materials held up the work. They were, however, in use at the end of the year.

The herd numbers are as under, the previous year's being given for comparison.

	On 31-12-46	*On 31-12-47*
Boars	5	2
Sows	9	11
Fatteners	101	67
Lard and sausage pigs	—	—
Totals	115	90

Poultry.—The rate of increase was rather disappointing but improved towards the end of the year. White Leghorns and Rhode Island Reds only were kept during the year; the intention is, early in 1948 to go in for cross-breds for egg production. The laying flocks were out on free range on the temporary grassland near the farm yard throughout the year. The flocks were comparatively free from disease. The numbers were as under; every effort will be made to increase the flock to try to meet more nearly the requirments of the school for eggs.

	On 31-3-46	*On 31-12-47*
Stock cocks	8	8
Hens	99	127
Pullets	48	—
Cockerels	48	1
Chickens	—	202
Totals	203	338

Sheep.—Sheep have not really a very important place in a small intensively run mixed dairy farm such as this with the market in its present undifferentiated state. They are kept as a demonstration for students and as useful followers on the grassland. A small revenue is obtained from the sale of wethers and wool. Footrot was prevalent in the earlier part of the year on account directly of the heavy rainfall and indirectly on account of the fact that with the unprecedentedly heavy rainfall some of the better new grassland became too long to be satisfactorily kept down by the cattle then on hand; consequently the sheep suffered. A footbath and race were constructed and footrot was eventually controlled. The numbers in the flock were as under:—

	On 31-12-46	*On 31-12-47*
Rams	1	1
Ewes	54	53
Wethers	42	4
Lambs		69
Totals ..	97	127

Horses.—The three horses bought in 1946 remained on the farm throughout the year. Stable management was taught. The old milking shed and dairy were converted into stables at the end of the year.

Buildings.—The major work undertaken is given below:—

New dairy and milking shed completed.

Two milking machine engine houses added to the dairy.

African camp enlarged, including cottages, latrines and wash-houses

School built in African camp, including master's room and store.

New fattening pens for pigs nearly completed.

New farrowing pens completed.

Incubator house commenced.

Movable bail built.

Old milking shed and dairy turned into stables.

Building for bacon curing built.

Sheep footbath and race built.

Bull paddock strongly fenced.

Stone drains from dairy and piggeries built.

Labour.—The supply continued to be better than in the earlier part of 1946. The system of supplying full rations and of giving bonuses for good work was continued. The aim is the development of a "cottager" type of permanent labourer or artisan, with his family on the farm. The school for the children of employees will be opened next year and a canteen may be started.

Land Development.—Noted under a separate heading earlier in this report.

Vegetable Production.—No progress could be made because again water for irrigation was not available. The bore-hole came into use at the end of the year and it is expected that production will be considerably increased in 1948. Nucleus gardens were maintained and instruction in vegetable growing was given.

Fruit.—A new site for an orchard was chosen, on old permanent grassland. It was hoped to plant it partially in the August rains but unfortunately the trees ordered failed to arrive. The land was therefore planted with vetch and grazed. It will be bench-terraced in April, 1948, and planted in May, 1948.

Accounts and Revenue.—Cost accounts were kept and provided a basis for instruction. They were centred on man, ox and tractor daily power allocations

which enabled costs to be put to productive accounts through allocation accounts. The gross revenue from the farm was £3,362. The estimated revenue for 1948 is £4,000.

Costs of Production:—

	Sh.	*cts.*
Maize.—Per acre exclusive of management charges and bags.		
Yield 11 bags over all, including 15 acres badly tended under tuition	73	95
Wheat.—Per acre exclusive of management charges and bags.		
Average yield 7.5 bags per acre	71	14
Barley.—Per acre exclusive of management charges and bags and transport to rail as home-fed ..	50	67
Whole Milk.—Per gallon without management charges		43
Oat Hay.—Per ton without management charges ..	24	00
Maize Silage.—Per ton without management charges	6	25

Bacon Pigs to 200lb. Live Weight:—

Ration—		*Sh.*	*cts.*
Maize	40% =	3	00
Barley	35% =	2	10
Bran	10% =		30
Pollard	10% =		37
Meat meal	5% =		73
Total per 100 lb. ..		6	50

* Estimating 3½ lb. of ration produced 1 lb. live weight gain.

	Sh.	*cts.*
Cost of food	=40	50
Green food	=12	00
Labour	= 4	50
Transport	= 3	00
Depreciation	= 4	00
Medicines, etc.	=	50
Total ..	64	50

	Sh.	*cts.*
Proportion keep of sow	=12	80
Service of boar	= 1	50
Total ..	78	80

Management charges: say Sh. 10.

* The right type of pig, under proper management and being fed a balanced ration will increase in live weight by 1 lb. for every 3½ lb. of meal consumed, but it can well be imagined that in some herds this figure could approach even up to 5 lb.

Staff

The staff at the end of the year:—

Principal.—J. E. P. Booth.

Vice-Principal and Instructor.—T. L. McClelland, Senior Assistant Agricultural Officer.

Farm Manager.—B. H. Robson.

Warden and Instructor.—C. A. Thornton.

Secretary.—Mrs. A. Williamson.

Accountant.—Mrs. J. M. Robson.

Medical Officer.—Dr. J. B. Scott.

Nursing Sister.—Mrs. D. Thornton.

Veterinary Officer.—J. D. Tremlett.

Instructors.—M. A. Barrett, Agricultural Officer; E. L. Bradford, Senior Assistant Agricultural Officer; P. Ward; J. C. Kean.

Engineering Instructor.—P. Carey.

Housekeepers.—Mrs. C. Herbert; Mrs. Marshall; Mr. and Mrs. Dickson.

Childrens' Nurse.—Mrs. Macadam.

Future Policy

In 1949 it is proposed to run the present one-year Agricultural Certificate course, which is the course attended by settlement scheme candidates and Government Officers in training, but to make it, in addition to its present function as a complete one-year course in practical farming, the first year of a two-year diploma course, the second year of which will be run, it is hoped, for the first time in 1950. By 1950 or before it is hoped that the laboratory will be more completely fitted and stocked and that the dairy technology section will be more completely equipped. In 1948 it is contemplated that a new building for the dairy technology section will be constructed and that specimens and more apparatus will be available for the veterinary section.

The diploma course will have to be backed by these and other additional facilities which will enable a more scientific approach to be introduced into the tuition of the second year of the course. It will also be necessary to put the farm on to more of an investigational footing.

It is felt that for the purposes of the proposed Diploma course the present Certificate course in practical farming should be retained as the first year syllabus because, as many students likely to attend it will not have had the extensive real farming practical experience now demanded by colleges in the United Kingdom and elsewhere, it is desirable that students should learn how to farm before going on to the study of the why and wherefore of farming.

J. E. P. BOOTH,
Principal.

THE EGERTON SCHOOL OF AGRICULTURE

Syllabus of the Basic One-Year Agricultural Certificate Course

I. *The Soil.*

(*a*) Soil formation.
(*b*) Characteristics of soil and nature of soil fertility.
(*c*) Plant growth; relationship between soil, plant and animal.
(*d*) Classification of soils.
(*e*) Manures and manuring.
(*f*) Tillage.
(*g*) Rotation of crops.
(*h*) Soil erosion control.
(*i*) Ecology and vegetation types.

II. *Animal Husbandry.*

(*a*) Animal anatomy and physiology.
(*b*) Diseases of live stock.
(*c*) Animal nutrition: rationing.
(*d*) Dairy herd management.
(*e*) Beef production.
(*f*) Care and use of work oxen.
(*g*) Pig rearing.
(*h*) Poultry keeping.
(*i*) Management of a boran dairy herd.
(*j*) Management of horses.
(*k*) Sheep management: their position in Kenya farming.
(*l*) Animal breeding.

III. *Crop Husbandry.*

Crops will be treated under these main heads:—

Suitability of areas by soil and climate for various crops.
Cultural treatment.
Harvesting and storage.
Yield and marketing.
Uses.
Diseases and pests.
Crop characters and varieties.
Residual values.
Implements required.
Future breeding aims.

A. *Cash Crops.*

(*a*) Maize.
(*b*) The cereals.
(*c*) Pyrethrum.
(*d*) Trees on the farm.
(*e*) Wattle.
(*f*) Flax.
(*g*) Potatoes.
(*h*) Vegetables.
(*i*) Fruit.
(*j*) Essential oils.

B. *Fodder Crops.*
- Hay crops.
- Crops for ensilage.
- Crops for soilage.
- Root crops.
- Linseed.
- Legumes.
- Green manures.
- Lucerne for meal.

IV. *Grassland.*
- (*a*) The keystone of intensive farming.
- (*b*) Types of grassland on the farm.
- (*c*) Establishment of leys.
- (*d*) Management of leys.
- (*e*) Reversion to grass.
- (*f*) Management of permanent grass.
- (*g*) Carrying capacity.
- (*h*) Grass types.
- (*i*) Feeding values.
- (*j*) Effect on soil fertility.

V. *Farm Engineering (Including Surveying).*
- (*a*) *Workshop Practice.*
  - (i) Iron working.
  - (ii) Wood working.
  - (iii) Blacksmithing.
  - (iv) Lathe working and drilling.
- (*b*) *Farm Implements and Machinery.*
  - (i) Construction.
  - (ii) Maintenance.
  - (iii) Use.
  - (iv) Major repairs which cannot be done on the farm.
  - (v) Minor repairs which can be done on the farm.
- (*c*) *Building Construction.*
  - (i) Stone work.
  - (ii) Brick work.
  - (iii) Concrete and cement work.
  - (iv) Calculation of quantities.
  - (v) Preparation of plans and drawings.
  - (vi) Roofing materials and laying roofs.
  - (vii) Flooring materials and laying floors.
  - (viii) Application to various farm buildings: farm building design.
- (*d*) *Internal Combustion Engines.*
- (*e*) *Water Engineering and Plumbing.*
- (*f*) *Fencing.*
- (*g*) *Road Making; Drainage.*
- (*h*) *Surveying.*

VI. *Farm Management and Farming Systems.*
- (*a*) History of farming in Kenya.
- (*b*) Farming systems of Kenya.
- (*c*) Suitability of various systems to different districts.
- (*d*) Choosing and taking over a farm.

(*e*) Developing a new farm.

(*f*) Running a farm:—

System to be used.
Saleable commodities.
Crops marketed through live stock and men.
Allocation of land; plough; grass.
Allocation of power.
Rotation for fertility, optimum production and optimum labour utilization.
Layout and planning.
Water supply.
Tractor *versus* ox.

(*g*) Records, accounts, costing.

(*h*) *See* representative farms.

This part of the syllabus is a summary and brings together in perspective information given in other parts

VII. *The African as an Employee.*

(*a*) Kenya tribes and their characteristics.

(*b*) Study of Kiswahili.

(*c*) Feeding, housing and welfare.

(*d*) Conditions of employment; employer's responsibilities; legislation.

(*e*) Capacity for work; allocation of work; work organization.

(*f*) Future of the African as a farm worker.

(*g*) Outline of the history of East Africa.

VIII. *Legislation.*

(*a*) Crops.

(*b*) Live stock.

(*c*) Land, forests and water.

(*d*) Farm workers.

(*e*) Land registration, etc.

(*f*) Insurance.

THE EGERTON SCHOOL OF AGRICULTURE

Syllabus of the Short Refresher Course

I. *The Soil.*

The relationship between soil fertility maintenance and husbandry methods.
Soil conservation and tillage methods.
The use of grassland in mixed farming; alternate husbandry systems.
Rotation of crops.
The making and use of farmyard manure.

II. *Livestock Husbandry.* (Cattle, Pigs, Sheep and Poultry.)

Principles of feeding.
Care and management.
Breeding policy.
Housing.
Diseases.

III. *Crop Husbandry.*

Cultural and harvesting methods of the principal crops.
Pests and diseases of the principal crops and their control.
Breeding aims.

IV. *Farm Engineering.*
Choice of correct implements and machinery.
Maintenance of implements and machinery.
Suitable types of buildings for various purposes.
Fencing.

V. *Farm Management and Economics.*
Farming systems.
Choice of farm.
Developing a farm: layout and planning.
Organization of the running of a mixed farm.
Records and accounts.
Labour.
Legislation affecting farming.

THE EGERTON SCHOOL OF AGRICULTURE

Syllabus—Extra Subjects for Wives of Settler Students

1. *Dairy Products.*
Butter making.
Cheese making.

2. *Animal Husbandry.*
Calf rearing.
Poultry keeping.
Horse management.
Common ailments of farm animals.

3. *Horticulture.*
Vegetable gardening.
Fruit growing.

4. *Animal Products.*
Bacon and ham curing.

5. *Farm Accounts.*

6. *The African.*
African tribes.
The African as a labourer and servant.
Engaging and dismissing African servants.
Swahili.

7. *Health and Hygiene.*
Health and hygiene in Kenya.
Human nutritional requirements.
Child welfare.
First aid and home nursing.
Medical treatment of Africans.

8. *Housing.*
Farm dwelling houses.

9. *Domestic Science.*
Cooking on wood stoves.
Bread making.
Making preserves.

10. *Motor Cars.*
Maintenance and running repairs.

11. *History.*
The story of East Africa.